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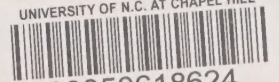


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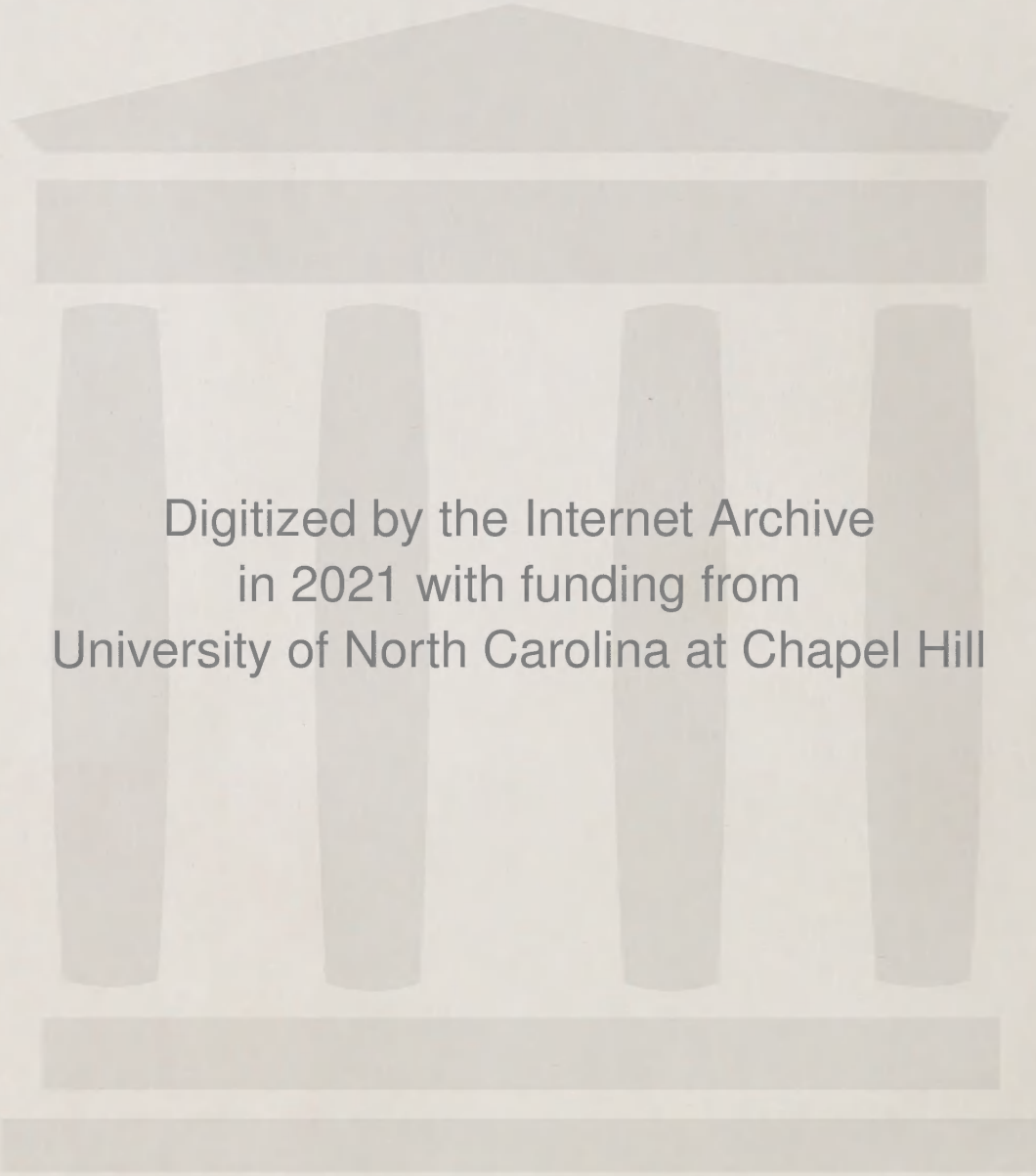
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August 9, 1971

Dear Mrs. Jett:

This is to acknowledge your inquiry of July 23, 1971, concerning our holdings of Southern Good Roads published in Lexington, North Carolina.

In checking the actual volumes of this title on our shelves (JE1.S8), we find that we have the same holdings as you stated in your letter:

Volume 21, Numbers 1-5, January-May 1920
Volume 22, Numbers 1-3, July, September, and
December 1920.

Our record files show that Volume 18, Numbers 2-5, September-December 1918, were not published. Our records also state that we lack "Volume 21, Number 6 (June 1920) if published?"

With regard to any issues which may have been issued in 1921, both the Union List of Serials and our records indicate that the publication probably ceased after the December 1920 issue.

Sincerely yours,

Carolyn S. Larson (Mrs)

Carolyn S. Larson
Acting Head, Reference Section
Serial Division

Mrs. Pat Jett
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SOUTHERN GOOD ROADS

HIGHWAYS - STREETS - MOTORING

Vol. XXI 111

Lexington, N. C., January, 1920

10c. a Copy



A Macadam Post Road in Maine—Note That Maintenance Has Not Been Neglected.

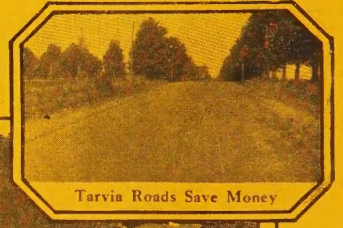
PUBLISHED BY

SOUTHERN GOOD ROADS PUBLISHING COMPANY
LEXINGTON — NORTH CAROLINA

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SOUTHERN GOOD ROADS

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\$50,000,000 for North Carolina Highways

By S. B. B. LEDSON

Publicity Agent, North Carolina Land Owners' Association

FOLLOWING a meeting of the executive committee of the Wilmington-Charlotte-Asheville Highway Association in Charlotte, North Carolina, January 2, it was announced that Governor Bickett will be asked to call a special session of the legislature to consider state-wide road laws, and that a mass meeting of citizens advocating increased expenditures for highways will be held early in the year in Raleigh.

The meeting was called, primarily, to discuss the proposed Wilmington-Charlotte-Asheville highway project, and every phase of the situation was gone into carefully. The meeting was presided over by W. A. McGirt, president of the North Carolina Good Roads Association, of Wilmington, and T. T. Allison, secretary of the Charlotte Chamber of Commerce, acted as secretary.

The proposition of requesting the governor to call a special session of the legislature was by unanimous vote of the members of the committee in attendance. This action was not taken, however, until the present situation as regards the demand for improved transportation facilities in the State, and the inadequacy of funds to fill these demands, had been thoroughly gone into and discussed from every angle.

Reports from various sections of the State showed an urgent demand for a bigger and better state road law. As a concrete example of this, attention was called to the fact that good roads bonds totaling more than \$20,000,000 have been authorized during the past few months, or since the last session of the legislature. Practically every county in the State has issued or is preparing to issue bonds for good roads. But the allotment of State and Federal aid is not sufficient to enable the county to build anything like permanent or hard-surfaced highways.

If the governor concedes to the wishes of those requesting the special session, and it is generally believed that he will, it is understood that this body will be asked to authorize the issuance of \$50,000,000 of bonds, the funds to be spent during the next five years in the construction of state highways, the work to be done under the supervision of the State Highway Commission.

It was the opinion of the committeemen that \$50,000,000 would greatly relieve the situation and make

it possible for counties to construct not only the main highways, but the local county road, also. As it is the county commissioners, in some cases, find themselves confronted with the problem of spending all their money on the main highways, because there is not sufficient state and federal aid to complete the construction of their links of the state system. This is not meeting with the general approval of the tax payers who live considerable distance from the main highways. If the commissioners are forced to spend all their funds on the main highways, the feeders must necessarily go unimproved.

Strong arguments favoring a state bond issue were made by Col. T. L. Kirkpatrick, president of the Wilmington-Charlotte-Asheville Highway Association and Dr. L. B. Morse, of Hendersonville. Others who urged more adequate state-wide legislation for hard-surfaced highways, included F. G. Henderson, of Union county, Heriot Clarkson, Esq., of Charlotte, and W. A. McGirt, president of the North Carolina Good Roads Association.

The railroad situation and the uncertainty of transportation was gone into at length, and it was the consensus of opinion that the most urgent need in North Carolina at this time is a complete system of state highways for the farmers and business in general. The State cannot hope to reach a maximum in development under the present system.

An Awakened South is Demanding Better Roads.

The improvement of highways is claiming the attention of practically every Southern State and some of the States have launched ambitious movements which promise to revolutionize the road systems. Of all the public works that now could be undertaken in the South there is not one more important than road improvement.

Alabama's campaign, which has for its goal the authorization of a \$25,000,000 bond issue for the building and maintaining of good all-the-year round highways in all of the counties of the state, is making progress and there appears little doubt that the bonds will be authorized when the people vote upon the proposed amendment. This will not be the largest sum to be spent on highways by a southern state, but it will be

large enough to insure a system of highways in Alabama that will be worth many times the sum expended. Texas, with its tremendous resources, is spending something like \$75,000,000 in road improvement, but the area of Texas is more than three times as great as that of Alabama, and \$75,000,000 spent there on roads will not mean as much as \$25,000,000 spent in Alabama.

Alabama's next door neighbor, Georgia, is setting a pace in road building that southern states may find trouble in matching. A report issued by the state highway department of Georgia shows that in ten months a total of 175 miles of paved thoroughfares have been completed at a cost of approximately \$30,000 a mile. Forty-six Georgia counties have voted bonds to the amount of \$16,500,000 for road improvement.

At the rate Georgia is going, that state will be in advance of Alabama in road work even with the \$25,000,000 bonds this state is preparing to issue. This, however, should merely cause Alabama to make greater effort and it certainly should cause Alabamians overwhelmingly to favor the proposed bonds for roads.

It is an awakened and a determined people that now are seeking an improvement of the highways in the South. The importance of good roads is appreciated now as it never has been before. The automobile has helped to make us realize that good roads are better than poor ones, but it is the farm wagon and the farmer's team that make the greatest appeal for good roads. With good highways to all the marketing points of importance in the state, the farmer would derive the greatest benefit, for with good roads large loads can be hauled, teams are saved from exhausting pulis and wagons last longer. Travel to town over a good road is a pleasure and the farmer who has

a good road to his county seat will be able to visit town frequently, his family will be put in closer touch with the world and life will be pleasanter for all. It really is the farmer who will benefit from road improvement. Of course the towns will reap a big benefit in increased business and the automobile owners will have greater pleasure in the opportunity good roads will offer for long trips, but the advantage that really counts will be on the farmer's side.—Anniston (Alabama) Star.

Good Roads in Georgia

Georgia among other states is pointing the way to good roads development. A report issued by the state highway department shows that during the past ten months a total of one hundred and seventy-five miles of paved thoroughfares has been completed, costing approximately thirty thousand dollars a mile. More than sixteen and a half million dollars worth of bonds have been voted by forty-six counties, which puts Georgia near the top of the list of states in good roads development. As a result of local activity, Georgia will receive \$2,700,000 in federal aid next year, and an additional sum of \$1,500,000 will be available from automobile licenses. To guide the expenditures, the state highway department is making a map which provides for 4,800 miles of good roads connecting the chief cities of the state. All of this is interesting to Alabama, which is now considering the better plan of a \$25,000,000 bond issue which would write Alabama large on the good roads map of America. Mobile (Alabama) Register.

Meeting of American Road Builders' Association.

The seventeenth annual convention of the American Road Builders' Association will be held in Louisville, Kentucky, February 9-13, 1920.



A Hartford, Connecticut, Pike—Macadam with Glutren and Oil Surface.

"Save the Land, the Land Will Save the Nation"

By W. A. McGIRT

President, North Carolina Good Roads Association

THE question naturally arises: How can we save the Land? Make the farm a good business proposition, and more men will be attracted to the farm life, and the present fast drift from country life to city life will cease.

In the earlier days the farm was simply a means of keeping alive. It is not so today, for with the ever increasing demand for food and the prevailing high prices, the farm is a paying proposition and looks more attractive to the young man who drifted away from the old homestead to make his abode in the big lighted city. It is this man we must look to, to Save the Land, for he has experienced the "grind" of city life and he has fond memories of the quietness of farm life. He also has a faint recollection of the mean, muddy, crooked country road which his forefathers bequeathed him, as an "attraction" to keep him on the farm.

Bad roads have forced more men and women from the farms into congested cities than all other evils combined.

Rural population is steadily on the decline, whereas cities are building up and increasing their population at the expense of the rural communities. This should not be the case, and whatever is contributing to the shifting of people from the country to city, be it bad roads, poor schools, bad health conditions, or a lack of marketing facilities, the conditions should be improved and farm life made more attractive to our people.

Practically all wealth comes from the soil and a highly developed back country is the main artery for nourishing and building up the Nation, the State, the city, and town. The country can live without the city, but the city could not exist long without the country. To save the Land, the Nation, and to feed the world, we must have more farmers, and to get them farm life must be made more attractive. Whatever commercial, industrial, moral, educational, or personal development you believe in, you know that Good Roads are a vital necessity for the advancement of all.

Whether you believe in preparedness for war—for peace—for defense—you believe in Good Roads. To the farmer a good road is a vital necessity. Good Roads place him in close proximity to competitive markets and enable him to dispose of his farm products at fair market prices. The farmer along the good road is no longer the victim of "low price" schemers. Farmers have come to realize that good roads mean easier work, greater profits, better crops, increased acreage, better living conditions, better homes, better schools, a happy and contented family.

It is perfectly obvious that good roads are playing a big part in the development of the Nation, the States, the counties, the cities and towns. Wherever there is any marked development, you find good roads and good streets. The more active and progressive com-

munities build good roads and are careful to see that the roads are properly maintained after they are built.

There is no line of business, large or small, which is not directly benefited by a system of good roads. All attempts to develop a road system, by first building local roads, have failed. Not until trunk lines were built was there any material advance in road construction. These trunk lines brought the demand for the building of the local feeder lines. Branch railroad lines were built after the trunk lines were established, otherwise they could not have existed.

I am compelled to ask the question: "Can there be any serious objection to the National Government building a system of highways to serve as the main trunk lines within the several states?" Why is it not done? How many statesmen are we going to bury before our great nation will take cognizance of this urgent need?

Is the great State of North Carolina ready to go into the business of road building on a scale commensurate with the State's needs, and build a complete system of hard-surface highways connecting the county seats? **How many governors will pass away before our great State will build a state-wide system of highways?**

There is work for all, and the counties will have enough to do to finance and build the local roads or feeder lines, if the national and State governments should ever decide that it is a part of their business to build the main highways or trunk lines.

Select ten of the leading States, the States which are making progress and you will find them, without an exception, keenly alert to the importance of good roads and State highways. I refer to the States of New York, Maryland, Florida, Maine, Texas, Kansas, Virginia, Georgia, Arkansas, and others. Illinois recently voted \$60,000,000 for improved highways. North Carolina is saving her money to pay the ancient and time honored mud tax.

I have seen prices on land advance 100 to 500 per cent after a good road had been built through the tract. Land which could be purchased for \$50 an acre, had increased to \$250 and in some instances to \$500 an acre, after the good road was built. With such an increase in values the improved road pays for itself, and it develops new farms, bigger and better crops, better homes, better schools, better churches, better community life, and a satisfied and contented people.

Farmers, merchants, bankers, and manufacturers should unite and demand a system of National Highways, a system of State Highways, and Good Roads everywhere. The farmer can save the land and the Nation, but to do this, he must have Good Roads.

Commissioners of Sebastian county, Arkansas, road district, have awarded a 72-mile contract for \$1,400,000.

Southern Appalachian Association

Eighth Annual Meeting to be Held at Asheville, North Carolina, February 26, 27 and 28, 1920

The eighth annual session of the Southern Appalachian Good Roads Association covering the states of: Maryland, Virginia, West Virginia, Kentucky, North and South Carolina, Georgia, Florida, Alabama, Tennessee and Arkansas,—will be held in Asheville Thursday, Friday and Saturday, February 26, 27, and 28, 1920.

The last session was held in Nashville, Tennessee, in 1918 and went on record as favoring the enactment of uniform statutes relating to the more permanent construction and maintenance of highways and transportation thereon. To favor the establishment and construction of interstate highway systems throughout the states embraced by the Southern Appalachian Good Roads Association; the establishment of a state controlled maintenance system and the application of all automobile license tax to the maintenance of state and intercounty roads, to be applied under the supervision of the respective state highway departments; the uniform state laws with reference to speed of motor vehicles and weight of loads on vehicles, together with a reciprocal relationship between the various states in reference to the use of such vehicle.

In addition to the above, the Nashville session went on record as condemning any advertising signs or emblems placed along the roads that might tend to confuse traffic and drivers, or that might endanger public safety and urged the use of federal, state, county and municipal prisoners for the building of roads.

These and other questions of importance, especially

the urgent necessity of an interstate system of hard surfaced highways, will be among matters for discussion at the Asheville session of the Southern Appalachian Good Roads Association February 26-28.

It was originally intended to hold the meeting January 15 and 16, but the date was changed to February 26-7-8 in order to accommodate a number of state highway officials who could not be present on the former date.

With the increased interest in paved highways and uniform legislation, in connection with automotive traffic, the Asheville session bids fair to be largely attended and of unusual interest to all persons interested in road construction, automotive construction and the manufacture of machinery for road building equipment.

The Governors of each of the seven states composing this association have been requested to name delegates at large for the state and furnish the list to N. Buckner, Secretary, at Asheville, North Carolina. In addition to this Chambers of Commerce, Boards of Trade, Good Roads and Automobile Associations in the various states have also been requested to send list of delegates to him that are likely to attend the Asheville meeting.

It is claimed that Buncombe county, of which Asheville is the capital, has more paved roads than any county in the south, and this visit will enable good roads enthusiasts of the south to examine the best construction of concrete and the various types of asphalt-macadam roads in the Asheville district. The



Hard Surface Road from Asheville to Waynesville, North Carolina.

Dixie highway across Buncombe county, 28.3 miles, is paved about half and half with concrete and asphalt-macadam. The Central highway from Asheville east to Ridgecrest, located on the Great Eastern Divide, is now being built with a five inch concrete base, with a two inch asphalt wearing surface. It is expected to complete this stretch of road during the summer of 1920.

Millions for Good Roads.

What Tennessee road advocates attempted to do in securing the passage of a \$50,000,000 bond issue to finance the construction of a state system of permanent highways before the last legislature and failed, Virginia, North and South Carolina and Georgia are planning to do during the 1920 sessions of their legislatures, according to V. D. L. Robinson, secretary of the Dixie Highway Association and the Chattanooga Automobile Club, who has just returned from road conferences in Virginia and the Carolinas. While in Roanoke, Mr. Robinson attended the organization meeting of the Lee Highway Association, which will promote the completion of a highway from Gettysburg to Chickamauga, and on through Birmingham to New Orleans.

The business men of Virginia and North Carolina, who have in the past left the solution of the road problems to politicians and the few good roads enthusiasts who have made the promotion of highways a hobby, are realizing that it is a business problem which vitally concerns the welfare of their community and state, said Mr. Robinson. They are, therefore, taking a hand in establishing road construction and its financing on a strictly business plane. Their examination of the needs of their states showed conclusively that it is going to be necessary to provide a budget sufficiently large which would permit the state highway department to build a state system of paved roads as rapidly as they could be constructed, without the necessity of calling on any county to participate in the cost of construction or maintenance of these state highways. In order to be fair to the communities whose state highways may not be among those constructed, the first or second year, the budget would have to be sufficiently large eventually to complete the entire state system, whether it be 3,000 or 5,000 miles. The \$40,000,000 bond issue advocated by the governor of Virginia, and the \$50,000,000 bond issue being campaigned for by the North Carolina Good Roads Association, seems to the business men of these states to be the logical way of providing a definite state highway system of a permanent type of roads. From the sentiment encountered by Mr. Robinson the appearances are that both of these bond issue measures will carry. South Carolina lost its bond issue measure in 1919 by only one vote, and those favoring the movement are confident that it will go over for a larger amount in 1920. Georgia will complete its legislative program for a \$50,000,000 bond issue in 1920. The Alabama legislature has authorized a \$25,000,000 bond issue in that state. One of the state senators in Kentucky, with the administration back of him, has announced that he will advocate the passage of a \$50,000,000 state bond issue before the next legislature of his state, which meets in the early part of next year.

While Tennessee can't get action until 1921, it is believed that this state will also get in line to enable

its state highway department to proceed with the construction of the state highways without the loss of time now required in getting all the counties on a given section of a state highway first to agree to put up its part of the money and then go through the campaign and election to secure the passage of a bond issue to provide the money.

Both Virginia and North Carolina are going ahead with road construction as rapidly as the limitations of their laws will permit, said Mr. Robinson. At the Roanoke meeting, State Highway Commissioner Coleman, who is one of the greatest state highway engineers in the country, told the advocates of the Lee highway that he would complete the Lee way through Virginia in half of the time if the legislature of the state would give his department the necessary funds to construct state highways as rapidly as they can be built.

National Grange Endorses National Highway System.

Proceeding in accordance with instructions given them at the annual meeting of the National Grange, held recently in Grand Rapids, Mich., Washington representatives of the organization which comprises some 700,000 farmers, have conferred with Senator Charles E. Townsend, of Michigan, and will hold further meetings with him on the measure which he has introduced in Congress providing for a national highway system to be built and maintained by the Government under the control of a Federal commission.

In a special report adopted at the Grange meeting, it was held that the time has come when, with due regard for the present and the future necessities for permanent, hard-surfaced highways, all the highway activities of the National Government should be unified in a single administrative department under such limitation of powers as will secure the greatest possible degree of efficiency and economy in the expenditure of national funds.

In view of the large number of bills introduced at recent sessions of Congress and which indicate a varied opinion as to the best procedure, it was deemed inadvisable to approve any specific bill. The working out of a national highway law which will best serve the welfare of the whole country, distribute the expense of construction equitably between beneficiaries and take into account the needs of agriculture, was approved, however, and Grange representatives were instructed to assist in perfecting a law of this character.

The conference with Senator Townsend followed and others will be held with other members of Congress who have or who may introduce bills which seem to meet with the general policy set forth by the members of the Grange.

- In the meantime until a better plan has been placed in operation the Grange favors the continuance of the present co-operative plan between the National Government and the several States with the primary purpose of connecting farms of the country with market towns, railway and water transportation points, with increasing use of Federal funds for that purpose.

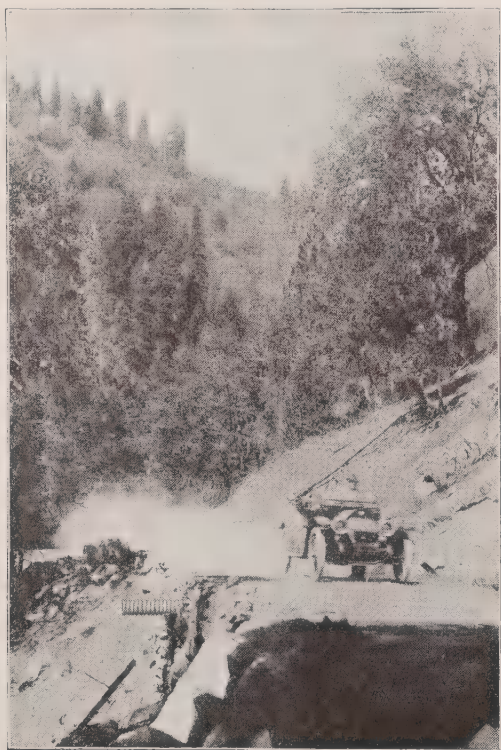
The work of surveying on the Asheville-Murphy-Atlanta highway in several counties of western North Carolina is well under way, according to reports coming out of Asheville, North Carolina.

Drainage of Country Roads

By W. E. SPAULDING*

Professor of Civil Engineering, University of Missouri

THE most important and difficult problem met in the maintenance and improvement of ordinary country roads is that of drainage. In order to maintain such a road in good condition, it is necessary to prevent water getting into it so as to soften the material of which it is composed. Drainage is especially important when dealing with an earth road, because the surface material of the earth road is more susceptible to the action of water and its stability is more easily destroyed than that of a road composed of harder material. Dry, compact earth may carry



This hillside road is properly drained with an Armoc Iron Corrugated Culvert. A ditch on the upper side of the road collects water flowing down the hillside, and the culvert carries this water under the highway, thus keeping the surface of the road thoroughly dry.

quite heavy loads without yielding, but when thoroughly wet the earth becomes soft, losing coherence, and a weight readily sinks into it.

When the road surface is of harder material, such as gravel, the earth beneath the gravel must be kept dry. Water may not readily penetrate the surface, but the subsoil must be dry in order to support the gravel firmly and prevent the surface being broken through by the loads which come upon it. The ability of earth to sustain a load depends in a large measure upon the amount of moisture contained in it. Most earths form good firm foundations so long as they are kept dry, but when they lose their sustaining pow-

er, becoming soft and incoherent. When softened by water, the subsoil may be easily displaced, thus permitting the foundation of the road to settle into it. The soft subsoil may also be forced upward into any open space existing in the super-structure, thus causing disintegration and resulting in destroying the solidity of the gravel surface.

The drainage required upon a road may be either surface drainage or under drainage, according to the source from which the water comes. Water may reach the road in any one of four ways: (1) Rain-fall upon the surface of the road, which can only be gotten rid of by keeping the surface properly smoothed and drained; (2) surface water coming from the sides, which may overflow the road unless stopped by side drainage; (3) water seeping through the ground from sides, which may soak into and saturate the subsoil under the road; (4) water coming from underground sources in the form of springs under the base of the road itself.

In any case where the improvement of a wet and muddy road is being considered, the first thing necessary is to find out why it is wet and where the water comes from. The effort should then be made to cut off the supply of water and prevent its reaching the road. It should always be kept in mind that the object of road drainage is not to draw water out of a wet road but to prevent the road getting wet. Surface drainage is always necessary. Under drainage is necessary where there is a chance for water to reach the subsoil beneath the road from underground sources.

Drainage of the surface of a road is provided by making the section higher in the middle than at the sides, with ditches or gutters at the edges of the road along which the water is conducted until it may be disposed of through some cross channel.

The slope necessary from the middle to the sides of the road to insure good drainage depends upon the character of the material of which the road surface is composed, being less as the road surface is more smooth and less permeable to water. For ordinary earth roads, the slope varies from about one to one and a half inches to the foot; for macadam or gravel roads about three-fourths inch to the foot. On an earth road eighteen feet wide, the surface of the road at the crown should usually be kept about nine or ten inches higher than at the shoulders.

In all cases it is important that the water which falls upon the surface of road should be gotten rid of as soon as possible, for so long as it remains upon the road, it is an element of danger, both from its tendency to wash the surface and from its liability to penetrate into the road and thus cause disintegration or settling.

Side drains or under drains are quite useless as means of removing water from a flat or dished road surface. The side ditches may be dry while the middle of the road is a deep mudhole. In order to drain properly, the surface of the road must be well crowned and it must be smooth enough to let the water which falls upon it flow immediately away.

The drainage of the surface of the country road is

*Reprinted by courtesy Highway Magazine.



The corrugated culvert pipe of Armo Iron installed under the above highway effectively disposes of surplus water

mainly a matter of maintenance and involves keeping the surface smooth and properly crowned.

The disposal of surface water on country roads is usually effected by providing side ditches along the edges of the road. These receive the water flowing from the road surface and carry it along the road to the first convenient cross channel into which it may be discharged.

Surface water coming from the ground at the sides of the road is usually caught by the side ditches and thus prevented from reaching the roadbed. The best arrangement for the side ditches and the shape which should be given them depends upon the local conditions surrounding the road and the amount of water to be carried by the ditches.

The slope on the side of the ditch toward the road should not be steeper than about one foot to three

feet. This would make it possible to cut the grass in the gutter with a mowing machine, and would not be a source of danger to a vehicle which chanced to drive over the edge. The outside slopes should cut back to a slope of about one foot to one and a half feet, to prevent the material sliding into the ditch and clogging it.

In very flat country, where opportunities for frequently discharging the water from the ditches may not be found, considerable water may need to stand in the side ditches. In such cases the road should be graded up sufficiently to keep the crown of the road well above the surface of water at the side. The water should never stand within two feet of the height of the crown.

The ditches should have a grade of at least one foot in a hundred in order that the water may run



Every road should be well crowned and must be smooth enough to allow water which falls upon its surface to flow immediately away. The above highway shows the result when this is not the case.

freely through them and be quickly disposed of. The surface of the road also should not be on a level grade, but should have a lengthwise slope of not less than one foot in a hundred to permit water to drain out of any small ruts or inequalities of surface that prevent water from reaching the side ditches.

Where the road has been cut along a side slope down which water is apt to flow toward the road, a ditch should be dug on the slope above the cut to prevent water flowing down the face of the cut. This will diminish the amount of water to be carried in the gutter at the side of the road.

When the road is on a steep grade and in a cut and considerable water must be carried in the side ditches, it may be a matter of difficulty to keep the ditches from being gullied and washed out at times of heavy rainfall. In such cases it may sometimes be necessary to put a pipe under the gutter into which the water may run from the gutter at frequent intervals. When the ground slopes away from the road on one side, as would usually be the case on hill roads, the water may be taken from the gutter on the upper side of the road and carried under the road in small pipe culverts placed at short distances apart. This will prevent the accumulation of sufficient water in the gutter to wash them out.

John E. Lovell Elected Director of Lee Highway.

A highway meeting of the new order was held at Roanoke, Virginia, recently, which formally launched the Lee Highway "From Gettysburg to Chickamauga," according to Mr. V. D. L. Robinson, secretary of the Chattanooga Automobile Club, who represented the club at the meeting. In the place of the oratorical pyrotechnics which might have been expected in the launching of a memorial highway to commemorate Robert E. Lee, the business men who had gathered from points along the highway realized that something more than sentiment would be required to bring about the completion of a highway even as far advanced as the Lee way is today. The busy afternoon and evening session resulted in the preparation and adoption of by-laws, the election of directors from all the states excepting Pennsylvania, Maryland, Alabama, Mississippi, and Louisiana, and the setting of January 19, 1921, as the next general meeting of the association. In addition to Secretary Robinson, Chattanooga was also represented by Clarence Wallace, of Signal Mountain Inn.

The Tennessee directors elected by unanimous vote of the convention are: John E. Lovell, president Chattanooga Automobile Club; John R. Williams, of Knoxville, and Lee F. Miller, of Johnson City. Other directors elected are: Senator Gray Silver, of Martinsburg, W. Va.; Prof. D. C. Humphries, Lexington, Va.; A. C. Elliott, Roanoke, and Henry Roberts, Bristol, Va. Directors from the remaining states will be elected for the first year's team by the new board, which will be followed by the election by the board of the president, vice-president, one vice-president for each state, secretary and treasurer.

The greatest enthusiasm in the project was manifested throughout the entire meeting, generated by the name of the man whom they were commemorating, the scenic and historical attractions which the route has to offer to tourists, the present passable condition of the highway during the major portion of the year and the certainty that the few remaining

gaps in the highway would be completed within two years. The large map on the wall indicated the directness of this route from the New England states to New Orleans. The attractions which it would offer to tourists would bring large numbers of motorists Florida-bound to use the highway as far as Chattanooga, then traveling the Dixie highway to Florida.

One of the most pleasing addresses during the meeting was that of Commissioner Coleman, of the state highway department, who told in detail of the work which is now being done and of the program of construction for 1920 along the Lee highway. The report indicated that the worst sections of the highway in the vicinity of Lexington and between Roanoke and Bristol would be rebuilt during 1920.

Jefferson County, Alabama, Planning \$5,000,000 Bond Issue for Roads.

Jefferson county is planning to replace present chert son county is planning to replace her present chert roads by a permanent and durable system of improved highways without a penny of additional taxation, according to a dispatch from Birmingham, Alabama.

At request of the Birmingham Chamber of Commerce, the Board of Revenues has called an election on February 16 to submit to the voters of the county the question of issuing \$5,000,000 in bonds for the construction of 322 miles of permanent roads in the county. Estimates prepared by the Chamber of Commerce show that Jefferson county is spending annually on road maintenance \$350,000, all of which is finally wasted, as these chert roads are falling into bad repair as fast as they are built. It has been shown that the same amount of money, now spent on temporary chert roads, can be applied to the construction of permanent highways so as to build and maintain 332 miles of permanent roads, pay the interest on \$5,000,000 of bonds, pay for the upkeep of the roads, retire the principal in 17 years and leave a surplus of \$2,500,000 at the close of 20 years.

A survey of the traffic has been made with a view to determining the routes which the permanent roads are to follow. Any road with a traffic of from 1 to 100 vehicles a day will have a D. D. degree, that is properly drained and dragged. This road will cost approximately \$2,500 a mile. Any road with a traffic of from 100 to 200 vehicles a day will be a hard-surface or chert road, slag or limestone, and will cost approximately \$5,000 per mile. Any road with a traffic of over 200 vehicles a day will be a concrete, brick, or bituminous-top road, and will cost approximately \$36,000 per mile.

Figures based on the traffic show that, aside from the direct saving to the county, the indirect tax, the gasoline, tire, and tonnage saving, will more than pay for building the permanent highway system in two years' time.

The Chamber of Commerce has appointed an advisory committee to confer with the County Board of Revenue on the expenditure of funds, and a campaign committee to present the facts on the bond issue to the public.

The Arkansas State Highway Commission has announced the approval of recommendations of the advisory board for allotments to eight road improvement districts aggregating \$157,495.59. The money will be paid out of the Federal funds.

Demand for Vehicles Exceeds New Mileage of Modern Roads

The Townsend Bill has recently been revised and strengthened to embody suggestions from various sections of the country. It has been named National Highway Act. The Federal Highway Council furnishes the following explanation and discussion of the measure:

Modern highway construction is not keeping pace with the demand for modern highway rolling stock. Motor driven vehicles are being produced in numbers far beyond the mileage of types of roadbed necessary to provide economic operation. And yet, great as the productive rate of new vehicles may be, it is far below current requirements.

These facts bearing upon the nation's highway transportation problems are being emphasized in highway development circles as additional reasons for expanding the activities of the Federal Government in highway construction. The measure known as the Townsend Bill, has been redrawn and reintroduced in Congress. Henceforth it is to be known as the National Highway Act. It now embodies all of the features desired by all sections of the country, and in its present form will be pressed to definite action as firmly and consistently as legislative conditions will warrant.

Two main objects—the construction of a National highway system and the creation of a Federal Highway Commission—are sought in the National Highway Act. It proposes that the commission shall establish, construct, maintain, improve, and regulate a national system of highways composed of connecting interstate roads which shall, by the most practicable routes and with due consideration for the principal centers of agricultural and industrial production, afford ingress into and egress from each State. Such national system may include highways to and from important water ports, and highways connecting at the border with the main highways in countries adjoining the United States, but shall not include any highway in a municipality having a population, as shown by the latest available federal census, of five thousand or more.

The proposed act also provides that the commission may make all necessary surveys and maps in connection with the establishment, construction, maintenance, improvement, or regulation of the National system of highways, and may construct, maintain, improve and regulate any highway which is a part of the national system, or, in its discretion, may contract with any state highway department for such surveys or maps, or for the construction, maintenance, or improvement of any such highway in such state. Any such contract with a state highway department shall be based upon and shall include plans, specifications, and estimates prepared by the commission, and the commission shall supervise and enforce the performance of such contracts.

It is also proposed that the portion of the national highway system in each state shall equal one per cent of the total highway mileage used as such in the state as ascertained by the commission. In every state where such one per cent will not suffice to enable the national highway system to afford at least two highways connecting with national highways in adjoining states, the commission shall increase the mileage of the national system sufficiently to provide two such

highways. This provision has been included to avoid any semblance of partiality to any particular state.

The commission will be authorized to select as part of the national system any highway which has been constructed by or in behalf of a state or civil-subdivision and which accords with a standard deemed by the commission to be adequate for present and probable future traffic, or which in the opinion of the commission, can be reconstructed to accord with such standard. The commission shall value the reproduction cost of any such highway at current prices and wages and shall construct, or may, in its discretion, contract with the state highway department for the construction of other highways connecting or correlating with the national system of mileage equal in value to the highway so selected, and to pay therefor out of the appropriation to be made for the construction of the national highway system.

One of the provisions of the proposed act is that no money so appropriated shall be expended in any state until the legislature of such state assents to the provisions of the act and to the taking over by the commission of existing state roads or rights of way as a part of the national system, except that until the final adjournment of the first regular session of the legislature held after the act takes effect, the assent of the governor of the state shall be sufficient to authorize such expenditures.

In consideration of the benefits to be derived by each state from the establishment of a national highway system, a condition precedent to the construction by the commission of any highway selected as part of the national system in such state, is that the existing right of way on the route of such highway shall be transferred by the state or the proper civil subdivision thereof to the United States as fully as may be permitted under the constitution of the state.

That only such durable types of surface and kinds of material shall be adopted for the construction and repair of any highway which is a part of the national system as will adequately meet the existing and probable future traffic needs and conditions. The commission will determine the types of construction and reconstruction, and the character of improvement, repair, and maintenance, in each case selecting the type and character best suited for each locality, proper consideration being given to the probable character and extent of future traffic. The commission is to be charged with the duty of establishing an efficient method of maintenance for all highways comprised in the national system which method shall be adequate for the needs of the traffic affected and shall set aside such sums from the appropriations provided as may be necessary.

It is proposed that all highways in the national system shall, unless in the opinion of the commission rendered impracticable by physical conditions, excessive cost or legal obstacles, have a right of way of the width of not less than sixty-six feet and a wearing surface of an adequate width which shall not be less than twenty feet.

It will be a part of the commission's work to encourage a more general use of public roads and highways and to collect, publish, and disseminate for the benefit of all sections of the United States, useful information on highway transportation, construction,

and maintenance.

That for the purpose of carrying out the provisions of the act, it is proposed to appropriate \$50,000,000 which shall become immediately available; \$75,000,000 for the fiscal year beginning July 1, 1920, and \$100,000,000 for each of the three succeeding fiscal years, in all \$425,000,000 which shall be available until expended.

It further provides that after deducting the running expenses and cost of maintenance, the commission shall annually apportion the remainder of each appropriation among the states in the ratio that the mileage selected in each state bears to the total mileage in all the states.

Enlarged Highway Body Recommended to Congress.

The Mississippi Valley Association, in annual session in Washington, D. C., passed a resolution to Congress, unanimously and without discussion, in line with the principles embodied in the Townsend Bill now pending before the United States, looking to the enlargement of the Bureau of Public Roads into one of the most active branches of the Federal Government.

Specifically the resolution states that "based on information gathered in the States of the Mississippi Valley, the conclusion of your petitioners is that the Bureau of Public Roads should be enlarged into one of the most energetic and useful in the Department of Agriculture and that the present Federal Aid System be undisturbed."

The Association recommended further that the present Federal Aid system be undisturbed, which is also in line with Senator Townsend's measure, the only point of difference being that the measure now in the hands of the Senate Committee on Post Of-

fices and Post Roads, and of which Senator Townsend is chairman, provides for national highway system under Federal construction and maintenance in addition to a continuation of the Federal aid policy. It also recognizes not only the necessity for the enlargement of the Bureau of Public Roads, but provides that the Federal administration be placed under a separate body whose sole function will be the study and administration of highway affairs, independent of any other branch of the Government. It is pointed out that this plan is consistent with the precedent set by the Department of Agriculture in requiring the organization of State Highway departments separate and distinct from the other branches of the State Government before the State can participate in Federal Aid.

Road "Reds" and Rotten Eggs.

Overripe eggs assailed the bad-roads boosters who drove recently into New Clarus, Wis., and attempted to distribute literature opposing the road-bond issue election about to be held in Green county.

You can't beat the good-roadster any more than you can beat a hard-boiled egg. So, armed with Biddy's castoffs, the New Clarusers laid down a barrage and wiped out a couple of Reds who crawled out of a mudhole to discourage the holders of the local good-roads meeting.

Green county's \$3,000,000 bond issue came warm from the nest, fresh laid, and from chickens to old hens and roosters, all had the well-known cackle for those Reds who had entered the wrong nest and tried to hatch out a doorknob.

There's nothing green but the name out that way when it comes to knowing—and Green county seen their duty an' done it nobly.—The Road Maker, Excavator and Grader.



Beautiful New York Highway Following the Picturesque Beaver Kill River for Miles.

North Carolina Should Arouse Herself

By COL. T. L. KIRKPATRICK*

Member of the Federal Highway Council, Washington, D. C., and Ex-Mayor of Charlotte, N. C.

The biggest question before the American people today is the problem of building hard surface, "all weather" roads. When we stop to consider that our aggregated wealth approximates three hundred billion dollars, that our square mileage amounts to about two and one-half millions, that we have a coastal frontage of nearly three thousand miles, and a population of one hundred million to feed, we can't but ask ourselves in all seriousness why it is that we have been so negligent in this all important matter.

We have spent needlessly in the construction of ornamental postoffices. We have spent four hundred and fifty millions of dollars in digging the big ditch, known as the Panama canal, for the benefit of mankind. We have wasted about 10 billion dollars in the last war, and have spent millions uselessly in every way imaginable, but it has never occurred to the average farmer, banker, manufacturer or merchant that the paramount question and need of our country is the construction of a great system of state and interstate highways.

For the pitiful sum of one and a half billion dollars, we could build two great continental highways, stretching all the way from New York to San Francisco and from Maine to New Orleans, figuring the cost to be \$25,000 per mile, which road could have been constructed, and it would have served directly 46 per cent of all the counties of the 48 states and indirectly 80 per cent.

We have approximately two and one-half million miles of road in the United States, and only one-fourth of one per cent of these roads are hard surface or "all weather" roads. For us to have as much hard surface roads as Prussia, it would require us approximately to have one and a half million miles of hard surface road. England with only one hundred thousand miles of splendid roads to care for is spending this year about one hundred million dollars. France with 85,000 miles of the best roads in the world will spend one hundred and fifty million and has a two billion dollar program ahead. Japan and China recognizing the industrial value of good roads have a program far in excess of what we have laid out, assuming the proportionate wealth of these two countries and ours.

It is an admitted fact that we have reached the conclusion that good roads are no longer a luxury, but an absolute and immediate necessity. We should demand that the national government appropriate a billion dollars to be expended in the next five years to build inter-state highways; that every pressure possible to be brought upon the citizenship of the respective states to duplicate this amount to build state highways; and that every available convict, both state and national, should be used in the construction of these great arteries of trade; and last, but not least, our representatives in Congress should see to it that all available material that is returned from France and that is on hand in this country in the way of trucks,

derricks, steam rollers, iron and steel and cement, etc., should be placed in the hands of the state highway commissioners to aid in the building of highways as rapidly as possible.

From a military standpoint, we should have two great coastal highways, traversing the Atlantic seaboard from New York to Florida and the Pacific coast from one end of it to the other. The rapid advancement in the automobile industry makes it imperative to the economical, agricultural, industrial and commercial life of the nation that we have hard surface "all weather" roads to properly build up and carry on the needed development of the citizens of the respective states. According to statistics, 50 per cent of the farm products perished on the sidetracks of the railroads companies for lack of proper transportation facilities. If we expect as a nation to build up a great export trade, which is absolutely essential in order to maintain our commercial standings with the countries of the world, we must have great highways leading to every seaport, order that the resources of this country may be carried in the bottom of our merchant marine to the ports of the world. It is a fact known to all men that our railway industries have been so badly crippled because of government management, and further because there has been no construction of new railway lines on account of the war, that it is impossible for the present common carriers of freight to carry the output of our industries from one point to another into the state, much less getting our products to the seaport for shipment.

In our own state, we have failed up to the present to resort to the need of the hour in the matter of good road building. Mecklenburg county was the first county 30 years ago to lead off in this great undertaking, but as progressive as this county was, we have not kept pace with the heritage left to us by our fathers. Our people have been so busy making money for themselves, that they have not had a vision big enough, broad enough, and comprehensive enough to care for the needs of the future. The special session of the legislature, at all hazards, should set apart the sum of 50 million dollars to build the Wilmington-Charlotte-Asheville highway, the coast highway, the Central highway, the Bankhead highway, and the highway running from Raleigh to Fayetteville. We, by nature, have been greatly blessed with climatic conditions, large resources, a native born population and a great seaport, but we are 25 years behind the time in taking advantage of these blessings. The citizenship of this state should arouse itself. Our farmers cannot prosper or retain their children on the farm unless they are given easy access with their neighbors and communication with the cities. We cannot hope to develop the religious life, the moral life, the educational needs, or our sanitary condition under our present system of bad roads. The merchant and the manufacturer are receiving 25 per cent less for their efforts than they should receive on account of poor means of transportation. Our sister states have aroused themselves—why should not North Carolina?

*A story appearing in the Anniversary Edition of the Charlotte Observer.



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OUR TENTH BIRTHDAY.

Southern Good Roads is this month celebrating its tenth anniversary. With this number it begins its tenth year of service to the South, and it is with pride for the record already made and the bright prospects for future helpfulness to the good roads cause that we pause a moment at this milestone. Looking back we see a South lifted from mud holes to macadam, from isolation and comparative stagnation to prosperity and progress, and we rejoice to believe that we have had, may we say without flattering ourselves, an important part in the accomplishment of these beneficent changes. And looking forward into the year 1920 and the years which shall follow it, we see a South lifted from macadam to hard surface, from prosperity and progress to greater prosperity and great progress, and we rejoice again in that we expect to continue to preach the great gospel of good roads and thus have a part in pushing our grand country further into the foreground.

Southern Good Roads was begun January, 1910, and was born of the desire to create a strong, healthy sentiment for better highways in the various counties of the sixteen Southern States. It was not the desire or the expectation of the publishers to make money, but fortunately the magazine has paid expenses with a surplus since the first three months of its existence. Southern Good Roads began when it was considered remarkable for a county to vote \$250,000 or \$300,000 in bonds for good roads, and the average man interested in good roads at all thought of them in terms of a district or a county. Today counties are voting bond issues in sums of \$6,500,000, and, the people are thinking in terms of the whole state and the nation. Remarkable progress has been witnessed.

Today Southern Good Roads stands at an era

pregnant with great possibilities and probabilities for highway development. The Federal Government has available millions of dollars which it desires to spend in the South. The states and counties are making provisions rapidly for raising more funds for highways. The country has been aroused to the point where it sees that good roads is the father of progress in any line, and the outlook is therefore bright.

As to the future of the magazine itself, it may be said that it was never brighter. Our subscription list is larger than it has ever been and is growing rapidly. The only cloud on the horizon that threatens to hinder the normal, rapid growth is the ever increasing cost and scarcity of print paper. Southern Good Roads believes, however, that it can take care of the situation and that it may serve its readers even better than in the past. Such, at least, is our sincere desire.

Road Work Facilitated by Federal Aid Amendments.

Amendments, passed last February, to the Federal aid road act have greatly facilitated the work of putting the country on a good roads basis, in the opinion of David F. Houston, Secretary of Agriculture. These amendments, in brief, increase from \$10,000 to \$20,000 per mile the amount of Federal funds that may be expended by one road and considerably broaden the definition of what constitutes a rural post road. The act, as it now stands, says Secretary Houston, in his annual report, places only three limitations on the type of road which may be built, as follows:

"That the roads shall be 'substantial in character.' This means that the road must be so constructed that it will carry the prospective traffic with such maintenance expenses that the total annual charges will represent a reasonable expenditure for the public service rendered by the highway. It is to the interest of the States that the roads on which Federal funds are used be substantially constructed, because the law requires them, or their civil subdivisions, as a prerequisite to receiving further funds, to maintain properly all roads built with Federal aid. There is nothing in the law which restricts types of construction between narrower limits than those established by sound finance and good engineering practice.

"That the amount contributed from the Federal Treasury in connection with any road shall not exceed 50 per cent of its cost or \$20,000 a mile. The main thing is to build a road that will stand the traffic in the particular section of the country where it is constructed. The conditions in certain regions may require a heavy, comparatively high-cost type of road, while in others a lower cost type may meet all the requirements. Sentiment is growing throughout the country, even in the newer sections, in favor of more substantial roads. The people are beginning to realize that the expense of maintaining the lighter traffic types under heavy traffic is unbearable.

"That the road must be a 'rural post road' as defined in the act as amended; that is, 'any public road a major portion of which is now used, or can be used, or forms a connecting link not to exceed 10 miles in length of any road or roads now or hereafter used for the transportation of the United States mails.' Under the original wording of the law, Federal funds could be expended only on roads upon which the

United States mails 'now are or may hereafter be transported.' This feature was the most troublesome to the highway departments of the various States. It required a definite determination in each case of the actual post-route status of the road, which necessarily involved delays in many instances. Under the new definition, very few important roads, if any, will be debarred from receiving Federal aid, if all the other requirements of the act are met.

"Following the amendments to the act, the regulations governing its administration and the standards for plans, specifications, and estimates were modified, and one of the most successful former State highway engineers in the country was placed in charge of the Federal aid road work. He has at his disposal a large staff of local and district engineer aids, and no pains will be spared to provide any further Federal assistance that may be needed. An advisory committee, composed of representatives of the State highway departments, selected at the request of the department by the American Association of State Highway Officials, with due regard to geographic considerations, also has been appointed to work in intimate touch with the Federal bureau, meeting with its officers at stated periods and at such other times as may seem desirable."

Secretary Houston believes that the Federal Government should continue its present policy of participation in road-building operations by the appropriation, if the financial condition of the Nation permits it, of \$100,000,000 for at least each of the four years beginning with the fiscal year 1922, to be expended under the terms of existing legislation.

Tentative Road Program for Florida.

Two million dollars for road construction during the year 1920 is the tentative program of the State Road Department of Florida, says a Tallahassee dispatch, and all of this amount is to be for State roads of a permanent type of construction, the surfacing to be vitrified brick, grouted, or concrete, or bituminous macadam. If brick or concrete is decided upon, the surface of these materials is to be nine feet in width, with rock shoulders on each side thereof 3½ feet in width, making the completed surface 16 feet. If bituminous macadam is used, the surface is to be 16 feet, with concrete curbing.

The first of the State roads to be built will be that portion of State Road No. 1 between Jacksonville and Lake City, a total distance of approximately 54 miles. This is the main east and west road across the northern section of the State extending from Jacksonville to Pensacola, and is the route traversed by the Old Spanish Trail and also by the western branch of the Dixie Highway. Bids for the construction of the Jacksonville-Lake City section of the above-mentioned road will be opened by the State Road Department in Tallahassee, Fla., on Wednesday, January 14.

The next section of road to be constructed will be on State Road No. 2, extending from the Georgia State line north of Jasper, Fla., through Hamilton and Columbia counties. This will interest State Road No. 1 at Lake City. The type of construction will be the same as that on State Road No. 1, but the date for opening bids for construction has not yet been fixed by the State Road Department.

In addition to the two roads mentioned, the department will also enter into contracts for the construction of State Road No. 1, from Lake City westward

to the Suwannee River. This will complete the road across Columbia county and entirely across Suwannee county.

If county funds are available to supplement State and Federal-aid funds, the same road will be constructed with a permanent type of pavement entirely across Madison county from the Suwannee River to the Jefferson county line.

Contracts will also be awarded during January for a bridge costing approximately \$100,000 across the Choctawhatchie River near Caryville, between Holmes and Washington counties; a bridge across the Blackwater River at Milton, in Santa Rosa county, costing approximately \$75,000, and possibly a bridge across the Escambia River, costing approximately \$200,000.

On State Road No. 2, the department will also award contracts for paving with brick, concrete or bituminous macadam entirely across Alachua county, and possibly across Marion county, to connect with the surfaced roads of Lake county. Then will come a section of State Road No. 2, in Orange county from Mt. Dora, on the Lake county line, to Plymouth, where it connects with the brick-paved road leading to Orlando.

State Road No. 3, known locally as the St. Johns River Scenic Highway, is to be paved in Putnam and Volusia counties under the supervision and control of the State Road Department. Funds have been apportioned by the State Road Department and the counties have sold bonds in sufficient amount to cover the cost of the construction. One of the three standard type of surfacing is to be used.

Along the east coast, on State Road No. 2, the State Road Department has apportioned funds to Brevard and St. Lucie counties, conditioned upon these counties meeting same with sufficient funds to complete the "missing link" in these counties. Bonding elections have been called, and will be held early in January. There is almost a certainty that these elections will be carried.

The Jacksonville-Waycross road, the northern end of State Road No. 4, is to be constructed by the State Road Department, and this work will be commenced as early during the year 1920 as practicable.

This shows that the \$2,000,000 referred to is only a starter for the work to be done by the State Road Department during 1920.

One and one-half million dollars for 100 miles of concrete roads in Fayette county, Tennessee, became an assured fact recently when a committee appointed at the October term of the quarterly court of Fayette county signed a contract with the state highway commissioner at Nashville for the project. Of the sum Fayette county will subscribe \$500,000 to be raised by a bond issue, the state and federal governments, will each contribute a like amount. The committee was composed of Mr. R. B. Young, Hon. C. A. Stainback, Hon. J. B. Summers and Mr. W. H. Wilkinson.

The spring of 1920 will witness the inauguration of a scheme of street improvement, which was decided upon for the city of Paris at a recent meeting.

The Washington County Good Roads Commission will on January 15, 1920, at 1 o'clock p. m., at the Chamber of Commerce rooms in Johnson City, Tenn., sell \$396,500 of Washington county road bonds.

Roads and Rural Welfare

By RODMAN WILEY*

Chief Engineer Kentucky Rock Asphalt Company

I KNOW of no question that more vitally affects men in every walk of life than Good Roads and Rural Welfare. With good roads, however, will come rural welfare, and with proper rural conditions everything that is desirable will follow. The high cost of living will be lowered by keeping the boys at home on the farms, thereby producing more foodstuffs. The back to the country movement has for a long time been advocated, but it is my opinion that it is impossible to keep the boys and girls at home on the farm, where they belong, unless the farm life is made attractive. In this day and time young people will not live on a farm where they are simply cut off from all communication with the world.

Society is so organized that we must give and receive. We exchange ideas and aspirations as literally as commodities. The moral and intellectual development of the race depend upon the facility of that interchange as literally as the industrial progress of a nation upon its transportation facilities. There is no better gage of the culture of a community, no surer index to the industrial and commercial prosperity, than in the sagacity with which it determines the products which it can produce most cheaply and exchange to the greatest advantage in the markets of the world.

We know that good roads are desirable, even necessary, but how many men are really giving the question the serious consideration it deserves? How many ever do any figuring as to the cost of roads or perhaps better said—the cost of bad roads? The fact must not be overlooked that a man living in an isolated district pays a bad road tax far in excess of any tax he would ever be asked to pay for good roads. On every article that he purchases, whether it be a threshing machine, a suit of clothes, a pair of shoes, a dress, or even the common garden rake, there is added the bad road tax, simply because the country merchant has to pay anywhere from forty cents to a dollar a hundred pounds for hauling his goods from the railroad station to the store, and that enormous cost must be added before he can even figure on adding a profit. It is not possible for man living on a mud road eight or ten miles from a railroad station to raise any products, so that he can compete with other men located on good roads and raising like products, because he must figure the cost of production *f. o. b.* the market place.

There are sections in Kentucky today where it actually costs more to haul goods one hundreds miles over the highways than it does to haul the same goods one thousand miles over a railroad or by water. There is really no excuse for such a great difference in the cost of transportation except the bad condition of the roads. Of all the systems of transportation, there being only three—the highways, the waterways, and the railroads—the highways are, to my mind, the most

important because they are the feeders for the other two. The highways are the only system of transportation owned, operated, and controlled by the people themselves, and, generally speaking, I would say that it is the only one of the three systems that is not properly managed. Every change in administration ushers in new men with untried impracticable theories regarding the roads. Those pet theories are often put into execution, and unfortunately the taxpayers suffer for every mistake that is made.

It is now impossible in some sections of our State to have school in the winter time because the children consequently school is held in the summer and at that simply cannot get over the roads to the school houses; season of the year many of our boys and girls are working on the farms, in the mills or the mines in order to earn a livelihood for the family and they are deprived of any schooling whatever. Such a condition years ago was regarded as most deplorable, and in this day and time it is almost treasonable. Let us be sure that the accusing finger of posterity will not be pointed at us as having neglected our duty to the future young men and young women of this country.

It is not an uncommon thing for a man with a family living in a county where they have bad roads to sell his farm—in some instances a good farm, very productive—yet he is willing to sell that farm for \$40 or \$50 an acre, move to some other community where they have good roads, buy a farm, no better than the one he sold, and pay anywhere from \$200 to \$300 an acre in order that he may have the advantages offered by good roads, which mean good churches, good schools, and a happy contented people. That shows, in a small way perhaps, what that man figures good roads are worth to him, and more especially his family. Someone has ably said: "Roads rule the world, not kings nor Congresses; not courts nor constables; not ships nor soldiers. The road is the only royal line in a democracy; the only legislature that never changes; the only court that never sleeps; the only army that never quits; the first aid to the redemption of any nation; the exodus from stagnation in any society; the call from savagery in any tribe; the herald of prosperity. The road is umpire in every war, and when the new map is made it simply pushes on its great campaign of help, hope, brotherhood, efficiency and peace."

Men will say they are in favor of good roads, but naturally such is the case—the same as we are in favor of good air, good sunshine, and good health. Roads are a business proposition, and they require the attention of the most prominent business men of our country. Many a time have I seen the county officials of a county rejected at the polls because they had apparently done very little road work. Other men were elected to fill their places, and at the end of their term there was still the same dissatisfaction as there was before they assumed their duties. Another administration is tried, usually with the same result, simply because the people have not analyzed the situation. If they had investigated, it would have been found that the county has hundreds of miles of

*An address before the meeting on Rural Development of the Kentucky Conference of Social Work, Warren Memorial Presbyterian Church, Louisville, Ky., Nov. 21, 1919.

would-be roads and a road fund totally inadequate to do what the people want and demand. Roads cost money, but they are worth to the people hundreds of times their cost. George Ade said: "Good roads cost money, but show me a community that has invested in hard roads which are good the year round that would be willing to go back to the old mud road for a cash consideration." The fact that no county, no State, and no nation that has ever invested money in roads, is willing to sell the roads for what they cost, is, to my mind sufficient proof that roads are a good investment.

It would seem to me that if we really want roads, let us approach the question from a business standpoint. Employ an engineer to go to a county and make a careful survey of the needs of that county, taking into consideration the availability of materials, resources of the county, possible future development. In other words, make a real business report, and then the citizens could act intelligently.

The inter-county-seat system of roads in this State comprises about 8,000 miles. There is perhaps 6,000 miles of that system that need to be either reconstructed or built new, and figuring a cost of \$30,000 a mile, it will require \$180,000,000 to build that system. Under our present system of State aid there is expended on the system each year perhaps three million dollars of State and county funds. At that rate it will require sixty years to complete the system. It is doubtful if it will be completed within the life time of any of us here present.

The present State Road Commissioner, after carefully going into this matter, will propose at the next session of the Legislature that a State highway system be adopted. The aim will be to give every county at least one road and reduce the mileage to perhaps 2,500 miles. In order to secure the necessary funds to construct this system in the immediate future a

state road tax of twenty cents on the hundred dollars will be recommended. That will produce about four million dollars. The automobile licenses will also be increased to some extent so that perhaps a million and a half dollars will be secured from that source. It will also be proposed that the property owners living along the road pay some part of the cost of the road. We will receive about two million dollars from the Federal Government, and all told would have a road fund of perhaps eight or nine million dollars a year. The system proposed can be built within eight or nine years. It is easily seen that the State and Federal Governments will pay practically all of the cost of building the system, and they will also pay the cost of maintenance. If the people really want roads, the system which the Commissioner proposes will give us roads, and when it is completed the State will not be in debt one cent because of the excellent system of highways which has been completed.

Proud old Kentucky that once boasted of the best system of roads in the United States has for years been falling behind. We are now surpassed by many of our sister States. We are also behind in education. We should have a State University second to none in this country; a system of common schools unsurpassed, and the best system of roads in the United States.

The history of civilization has been a history of transportation facilities. Rome, at the height of her power, had roads leading to every part of her vast domains. All great warriors, all great kings, have been road builders. It is said that when Napoleon was asked what was the greatest thing he had ever done, after a moment's reflection, said: "that the system of roads he had given to France would perhaps prove the most beneficial to her." It took a century of time and a world war to prove that statement, but



Curve on the Wilmington-Charlotte-Asheville Highway Five Miles from Biltmore, N. C.

everybody knows that he spoke the truth. All men agree that the roads saved France, and perhaps indirectly saved many other nations from the Prussian heel.

Isolation is essentially the atmosphere of the savage. The crude barbarian living in his wigwam or narrow hut, supplying his own wants, seeing and knowing no people beyond his corner in the forest and his tribe can neither give nor receive from the world without. Torn from his narrow environment, travel alone will civilize the savage before he learns to read and write.

The wholesome atmosphere, the seclusion, and the peace of the country home in summer, does not compensate for the hardships and complete isolation of the country life in winter, when families are literally marooned by their own fire-sides, shut off from communication with their kind by impassable roads.

President and Other Prominent Men Intend to Attend U. S. Good Roads Association Meeting.

United States Senator J. H. Bankhead, president of the United States Good Roads Association, has notified J. A. Runtree, director general of the association, that he will appoint a committee of twenty-five prominent men and women to go to Washington on Thursday, January 22nd, to call on President Wilson, Vice-President Marshall and members of President Wilson's cabinet, and invite them to attend the Eighth Annual Convention of the UNITED STATES GOOD ROADS ASSOCIATION and the Fourth Annual Convention of the BANKHEAD NATIONAL HIGHWAY ASSOCIATION that meets in Hot Springs, April 12 to 17, 1920.

Hon. Charles H. Brough, first vice-president United States Good Roads Association, and Governor of Arkansas, will appoint and head a delegation representing the State of Arkansas to join the committee.

Hon. Geo. R. Belding, City Manager of Hot Springs, will also appoint and head a delegation representing the city of Hot Springs.

Hon. S. M. Nutt, President Hot Springs Business Men's League, will likewise head and appoint a committee to represent that organization. These four committees will meet in the parlors of the Raleigh Hotel, Washington, D. C., on Wednesday, January 21st, at 4 o'clock p. m., for the purpose of organizing and arranging the details to call on President Wilson and Vice-President Marshall on Thursday, January 22nd.

Senator Bankhead will arrange with President Wilson and others to receive the committee which will be composed of fifty or more. The committees will also be accompanied by Senators Sheppard, of Texas, Robinson of Arkansas, and members of the congressional delegation from Arkansas and other states.

It is hoped that President Wilson will accept the invitation, as it will be a splendid time for him to come south and spend a few days at the great health resort of Hot Springs.

Director-General Runtree will commence at once to arrange the details and notify the various members of the committee as soon as it is announced by Senator Bankhead.

By a majority of 246 to 6 Lubbock, Texas, has voted \$100,000 bonds for paving.

Annual Convention National Highway Traffic Association

Announcement has been made that the annual convention of the National Traffic Association will be held in the International Amphitheatre, Chicago, Ill., on Thursday, January 29, 1920.

NOTICE TO CONTRACTORS

Sealed proposals for constructing or improving the National Forest Road project located within or partly within the Pisgah National Forest, State of North Carolina, County of Transylvania, will be received by the Acting District Engineer, Bureau of Public Roads, U. S. Department of Agriculture, at Washington, D. C., until 12 o'clock M. on the 3rd day of February, 1920, at which time and place they will be publicly opened and read. The right is reserved to reject any and all bids, and none will be considered except those from contractors ascertained to be experienced and responsible.

The length of project to be constructed or improved is approximately 10.14 miles, and the principal items of work are as follows:

Grading. Building Culverts and Bridges.

The work embraced in this district shall be completed within one hundred fifty weather working days.

The contract form and the maps, plans, specifications, and estimates of quantities may be examined by responsible contractors at the following addresses:

Office of Vernon M. Pierce, Acting District Engineer, Room 506, Willard Building, Washington, D. C.

Office of W. L. Spoon, U. S. Senior Highway Engineer, Room 813, Commercial National Bank Building, Raleigh, N. C.

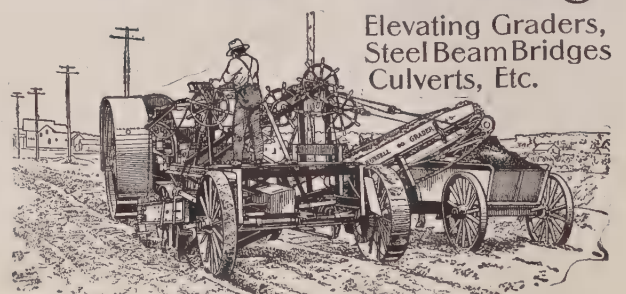
Office of Verne Rhoades, Forest Supervisor, Erumhor Building, Asheville, N. C.

All proposals must be made on forms, and in accordance with instructions, forming a part of the specifications above referred to.

VERNON M. PIERCE,

Acting District Engineer.

Russell Road Machinery



Elevating Graders,
Steel Beam Bridges
Culverts, Etc.

9 SIZES AND STYLES OF ROAD MACHINES
(From 500 lbs. to 7300 lbs.—5 ft. to 12 ft. Blades)

2 SIZES ELEVATING GRADERS; SCARIFIERS (4 sizes)

RUSSELL HI-WAY PATROL (2-horse, 1 man, wt. 1050)

RUSSELL ROAD FINISHER (fits road contour, wt. 2400)

Road Drags, Scrapers, Plows, Corrugated Culverts.

RUSSELL GRADER MFG. CO., MINNEAPOLIS, MINN.

Representatives in Principal Cities of U. S. and Canada

System of National Highways.

In an article recently Senator Townsend points out that civilization is but the result of the growth of means of communication. He says:

No individual or state can live satisfactorily in isolation.

I believe that we ought to have a nationalized system of roads. Let the states build the laterals, but let us have a system of national highways extending through every state, east and west, north and south.

It is of supreme importance that state and Federal aid should be based on sound business economics. The state should build and maintain strictly state roads and the state highway authorities should be held to strict accountability for the expenditure of the state's money. Only trained men with practical engineering ability and experience should be placed in charge of this work.

The real justification for public expenditure on highways is the promotion of civilization and the highest good for all the people.

Heaviest Tax is Bad Roads in Texas.

Here are some of the reasons why Texas pays its heaviest tax for bad roads:

Texas pays \$30,000,000 a year more for new automobiles because of bad roads than would be paid if all roads were good roads.

Pays \$20,000,000 more for gasoline than the same mileage would require if all roads were good roads.

Pays between \$20,000,000 and \$25,000,000 more for repairs on cars due to bad roads than would be paid if all bad roads were good roads.

Pays \$40,000,000 more a year for tires because of bad roads than would be paid if all were good roads.

Pays \$5,000,000 more for wagons and buggies because of bad roads than would be paid if all roads were good roads.

Pays more than \$100,000,000 a year as a tax on bad roads.

Pays five times as much tax for bad roads as is collected for all other purposes.—Exchange.

North Carolina Ranks High in Good Roads Program.

The North Carolina Highway Commission finds North Carolina ranks ninth among States as to bond issues for highways, says a recent Raleigh dispatch. When June comes in there will be \$3,000,000 from the United States, and June 1, 1921, there will be \$6,000,000 from the same source. Nine contracts for road building, it is said, were completed at the end of 1919. The hard surface roads have a total length of 100 miles undertaken since last March. The total length of highways of which the projects are already accepted is 1,135 miles. There are over 100 counties, and 78 of these have applied for federal and state aid. Buncombe county is now all hard surface and leads all other counties in the entire South. The Highway commission, it is said, will see that 1920 is a record road-building year in North Carolina.

New Officers of American Road Builders' Association.

Mr. Paul Sergeant, Maine, was elected president of the American Road Builders Association at the closing session of its convention in Louisville, Kentucky, December 10.

Other officers elected included Messrs. W. S. Keller, Alabama, vice-president; Joseph Hyde Pratt,

North Carolina, secretary, and J. H. Mullin, Minnesota, treasurer.

"The road movement is given a great impetus when a large state spends \$100,000 inviting people of the United States to help wear out its roads." It always did pay to advertise, and roads are no exception. Minnesota spent this money and it is all coming back to the citizens.—Exchange.

E. F. CRAVEN, Greensboro, N. C.

Will be glad to figure with you on your needs in Road Machinery.

The Charlotte Chemical Laboratories, Inc

Successors to FRANK P. DRANE, M. Sc.

Consulting, Research and Analytical Chemists

CHEMICAL ANALYSIS

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Specialists in Asphaltic and Bituminous Materials

Inspectors and Testers Placed on Job

Write Us for Contract Prices

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Do You
KNOW
That The

Wood Drill Works

PATERSON, N. J.

Makes ROCK DRILLS that can be "Cleaned Up With a Sledge Hammer" and "Wiped Off With a Scoop Shovel" and yet "Stay With You."

And they are sold by

Southern Machinery & Equipment Company
LYNCHBURG, VIRGINIA

and

E. F. Craven, Greensboro, N. C.

and

ROANOKE SALES CORPORATION
of Roanoke, Virginia

Also write us your wants

Good Roads Notes in Brief

What good roads have done for Ouachita parish, Louisiana, was demonstrated when Mr. W. T. Hunt sold to Mr. H. D. Goff, of Memphis, a 420-acre plantation for \$53,000. The same land was sold about two years ago for \$50 an acre.

The Dothan Good Roads Club has been organized at Dothan, Alabama, recently to promote interest and enthusiasm for the roads in the county.

The \$1,000,000 bond issue for better roads in Cape Girardeau county, was defeated recently by a vote of 1,855 against to 1,685 for the proposition.

The county judge of Jasper county, Missouri, has under construction the calling of a special election to vote bonds for the building of bridges in Jasper county. It is expected that the issue will be for \$250,000.

Livingston county, Kentucky, votes on road bonds January 31. The last election resulted in a tie vote.

Fannin county's, Georgia, good road bond election held recently went for bonds by a safe margin. Indications are that the vote will be about 1,200 for and two hundred against the issue.

Construction of new highways and repair on those already established in the South and especially in Tennessee and neighboring States will reach unusual proportions during the ensuing year, so predicts Mr. T. B. King, chairman of the Memphis Chamber of Commerce good road committee and vice-president of practically every great road movement which has started in Memphis in 1919.

Copies of blue prints and specifications are being held at the Chamber of Commerce in Bristol, Tennessee, for the bids of contractors on Federal construction of the Bristol-to-Mountain City highway, according to the statement of Mr. C. W. Roberts, who has the matter in charge in Bristol.

Plans and specification for a high type road which will cover practically all Desha county has been filed in the office of the Arkansas State Highway Commission by Carter & Lenox, of Little Rock. It is estimated that the improvements will cost about \$3,000,000. The road will be 110 miles long.

The highway construction program in Butler county, Arkansas, started recently when engineers began running lines and grades between the Wayne county line and Poplar Bluff and south to the Arkansas line. This is the first step in the recent \$1,108,000 program of highway work in Butler county.

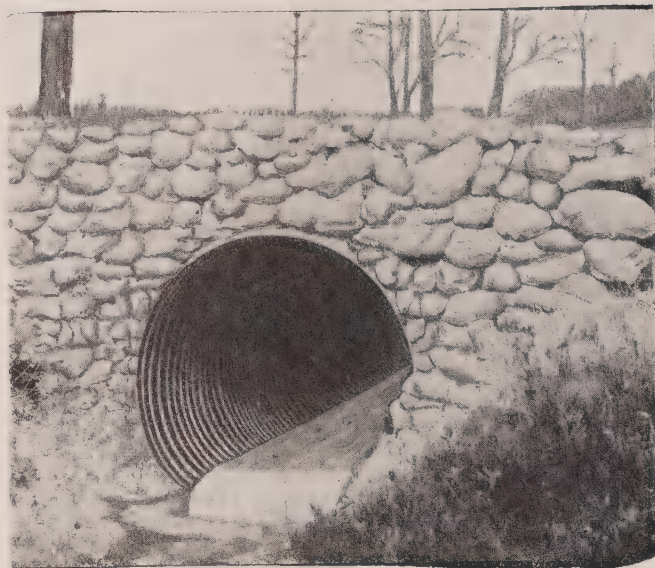
A dispatch from Memphis, Tennessee, says a new speedway two miles beyond the present city limits almost encircling Memphis will be built if suggestion of the park commissioners are carried out. The new parkway will be known as "Galloway Drive" and will be about 30 miles long.

"The business men of Sikeston have learned that temporary improvements do not pay in the long run and that the best is the cheapest. Charleston business men have established a great record along this line, and it makes us ashamed, and feel 'cheap' to hear that Byrd township, Cape county, takes the position and permanent roads are too expensive and that gravel roads are plenty good enough," says a dispatch from Cape Girardeau, Missouri.

Pike township in Stoddard county, Missouri, has voted to issue \$100,000 in bonds for hard surface roads by a vote of more than 30 to 1. Seven pre-

SPC. TONCAN METAL

for lasting culverts



**Installed seven years ago
---still in good condition**

This 72 in. Toncan Metal Corrugated Culvert was installed in 1912, under the Lake Emily Road, Ramsey County, Minnesota.

For seven years it has stood the rains and snows. It has held up under all kinds of traffic and is still in good condition.

It is natural for this corrugated culvert to give such good service because it is made from Toncan Metal—that super pure iron. It resists rust.

A post card or letter will bring you prices, or any information about Toncan Metal Corrugated Culverts. Address Dept. Q-68.

The Stark Rolling Mill Co.
CANTON, OHIO

cincts out of nine gave 470 affirmative votes to 14 against.

Plans for a two-deck privately owned suspension bridge over the Detroit river in Michigan to be built at a cost of \$28,000,000 are said to be under consideration. Local and Canadian capitalists are reported back of the project.

A large petition from taxpayers and property owners of the First and Fifth districts of Hines county, Mississippi, which included portions of the city of Jackson, has been filed with the board of supervisors. The prayer is for issuance of bonds aggregating \$75,000 for improvements, repairs and extensions of the graveled and macadamized roads.

Hankin county, Mississippi, has let a contract to build six miles of road for \$75,000. Lincoln county has contracted for eight concrete bridges to cost \$60,000.

Work has been started on the first ten miles contract of grading on the Orange county, Texas, roads under the million dollar highway bond issue. The contract was awarded to Grubbs and Hilton of Urg.

Actual construction work on Bee county, Texas, roads under the \$600,000 building program authorized some months ago by the taxpayers when bonds totalling that amount were voted will begin immediately upon arrival of road building machines, according to Mr. A. C. Pancoast consulting engineer.

Meeting of Southern Pine Association.

The Southern Pine Association announces that its annual meeting will be held on February 24, 25 and

2, 1920, at the Grunewald Hotel, New Orleans, as usual. Mr. J. E. Rhodes, of New Orleans, is secretary-manager.

One Billion Dollars for Building Roads.

At least \$1,000,000,000 will be available for the construction of roads during the present and the next fiscal year (beginning July 1, 1920,) it is announced by Secretary of Agriculture Houston. Of this great sum about \$680,000,000 represents federal funds.

Various States have authorized an aggregate of \$224,800,000 of bonds, and proposals for issues of \$314,000,000 will be submitted to voters next year. It is estimated that funds already provided will be sufficient to finance next year a program four times greater than any that has ever been undertaken.

The plan of "matching" every dollar of state money with an equal amount from the Federal treasury greatly stimulated the construction of new and the reconstruction of old roads.

"It seems clear in the circumstances that the principal limiting factor in the program for 1920 will be those of rail transportation, production of materials, adequacy of contractors' organizations and a supply of labor," Secretary Houston says.

Some Important Highway Projects.

A number of important highway projects in the South have been announced recently. Included among these are plans of the Commissioners of Wichita county, Texas, to build 100 miles of concrete road; \$2,000,000 is available. More than 50 miles of gravel

Are You Interested in Your Community's Growth?

If so encourage *Permanent Road Building and Street Paving*

Our Representative will visit you at any time supplying information as to most accepted types of paving

Estimates of cost furnished free upon request

GENERAL CONTRACTING
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MUNICIPAL IMPROVEMENTS
ROAD BUILDING
SEWERS

Robert G. Lassiter & Company

Home Office OXFORD, N. C.

Branch Offices: NORFOLK, VA. RALEIGH, N. C. DURHAM, N. C. GREENSBORO, N. C.

roads will be constructed in Taylor county, Texas; Lamar county, Texas, is active in this same direction. Other Texas cities and counties have awarded contracts for large amounts for similar purposes. The Commissioners of Chatham county, Georgia, will build bridges and culverts and do road grading and paving to the extent of nearly \$400,000.

Georgia's Extensive Plans.

Figures have been compiled showing that \$27,000,000 will be expended during the next several years for highway construction in Georgia.

Forty-four counties have voted bonds to the amount of \$17,420,000, and the federal appropriation for this state in 1920 will be \$7,602,000, in addition to another \$1,000,000 apportioned for Georgia army trucks and road-building materials. To this is added \$2,000,000 from state automobile licenses.

\$3,000,000 for Craven County Roads.

There is considerable interest in the proposed bond issue in Craven county, North Carolina. It is said that authorities regard it as practically certain that that county will vote a bond issue of \$2,000,000 or \$3,000,000 for better roads.

Talk of such an election was first heard some months ago, when Craven commissioners discussed the possibility of such a proposition carrying. Business men say that sentiment in the county is un-

doubtedly favorable. In numerous respects Craven is the closest neighbor to Lenoir, which set the example for the remainder of the eastern counties by voting \$2,000,000 last spring.

Lee county, Mississippi, is now spending \$500,000 on the improvement of its public highways. The county board of supervisors at its meeting in Senatobia recently sold \$300,000 worth of the bonds. One hundred miles of roadway will be graded during the winter and spring, and hard-surfaced. This expenditure does not include 12 miles of Memphis to New Orleans highway being constructed with Federal aid.

Chairman A. P. Carlton, of the Board of County Commissioners, Durham county, North Carolina, announces that Durham county will during the year 1920 carry out an unprecedented road building campaign.

Placing the average cost of our roads for next year at \$20,000 a mile and allowing but 400 tons of materials per mile, road construction will need not less than 20,000,000 tons of materials.

The annual convention of the Virginia Good Roads Association will be held in the auditorium of Murphy's Hotel, Richmond, Virginia, on January 14-15-16, 1920.



An 18" Diameter "GENUINE OPEN HEARTH IRON" Culvert Pipe in Use on the Weldon-Jackson Highway in Northampton County, N. C. Photograph Taken Feb. 17, 1916

THE photograph above gives an excellent idea of the resistance of "GENUINE OPEN HEARTH IRON" Culverts to extraordinary wear. It is not often that a Culvert of any type has to withstand the direct wear and tear of the heavy traffic coming in contact with the bare surface, but such is the case in this instance. This Culvert has been in use since the Fall of 1910, and as the picture was taken February 17, 1916, you can readily understand that it must have had rather hard knocks in that length of time. Our Mr. J. H. Slaughter took this photograph with a kodak and states that not only was this Culvert exposed in the manner shown, but at least a dozen more on the same road were installed under like conditions and have been subjected to the same rough treatment for the past few years.

We not only claim superiority for the material of which our Culverts are made, but also superiority of workmanship and therefore of the lasting qualities of our Pipe. We manufacture only one grade of "GENUINE OPEN HEARTH IRON" Pipe and have no seconds to offer in this material. Being a high grade material, it costs us more money than the ordinary grade of Galvanized Steel, and quite naturally we have to secure a better price for it. Therefore, beware of cheap Culvert Pipe.

The Newport Culvert Company, Inc., Newport, Ky.

Atlas Explosives



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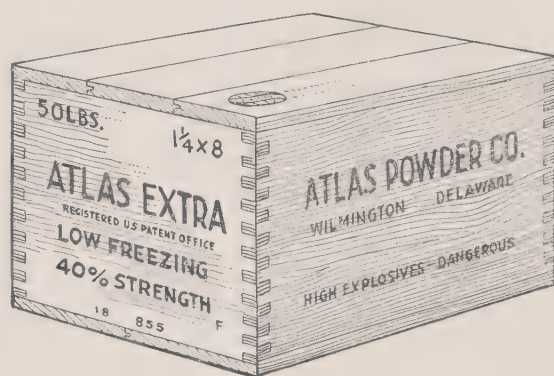
EVERY blasting requirement of the road builder may be met with Atlas Explosives. Whether your work is grading in earth, shale or rock, or in quarrying surfacing materials, there is an Atlas Explosive that will do the work economically and efficiently.

In our Service Division are men with long experience in the use of explosives in road construction work. These men will be glad to consult with you regarding the job you have in hand. They will co-operate with you to cut costs and save time and labor through the use of the proper explosives and the most effective methods of blasting. It is their business to see that users of Atlas Explosives get maximum results at minimum cost.

A letter to our home office or nearest sales office will put you in touch with this Atlas Service without obligating you in any way.

ATLAS POWDER CO. 143 North Front St.
PHILADELPHIA

Branch Offices: Allentown, Pa.; Birmingham, Ala.; Boston; Chicago; Des Moines, Ia.; Houghton, Mich.; Joplin, Mo.; Kansas City; Knoxville; McAlester, Okla.; Memphis; Nashville; New Orleans; New York; Philadelphia; Pittsburg, Kans.; Pittsburgh, Pa.; Pottsville, Pa.; St. Louis; Wilkes-Barre.



and this



made this

for road building



THIS ROAD WITHSTOOD TWO YEARS OF ARTILLERY CAMP TRAFFIC

This is the road from Louisville to Camp Henry Knox—Uncle Sam's big artillery encampment. Photo taken November, 1919. It was constructed in 1915 and 1916 of **Kentucky Rock Asphalt** on an ordinary macadam base. During the war it was subjected to a most gruelling test—a test unfair to any road.

Four thousand vehicles pounded over its surface every day for almost two years. There were army

trucks and caterpillars noted for their destructiveness to roads. There were tractors and tanks with their heavy drags. And artillery—big guns that weighed twenty-one tons.

Theoretically, this road long ago ceased to exist. Army traffic has ground to pieces the best highways.

Actually, the road is still there and in excellent condition—not a hole, not a crack, in its surface.

Kentucky Rock Asphalt---the Super-Asphalt

Kentucky Rock Asphalt was mixed by Nature in a process requiring thousands of years.

Its mineral aggregate is hard, irregular silica sand. Each grain is 100 per cent coated with bitumen. This would be commercially impossible with artificial mixtures.

Kentucky Rock Asphalt is laid cold on an ordinary limestone, hard sandstone, slag, granite or concrete base.

No special mixing or heating equipment is required. No skilled or experienced workmen are

needed.

The first cost of **Kentucky Rock Asphalt** is considerably lower than that of other high class pavements. The saving in repairs and maintenance is so great that in time the road will actually pay for itself.

Kentucky Rock Asphalt has made possible and practicable the surfacing of country highways with asphalt where heretofore the cost of laying and maintenance has been almost prohibitive.

EVERY State, County and City official, and any other individual interested in Good Roads, should have our booklet, "THE ROAD TO CAMP KNOX." It is a most interesting story of this natural paving material. Write for it today.

Kentucky Rock Asphalt Company

717 Jones Building

Louisville, Kentucky



MORE ROADS

In these days when man-power is in demand and labor **costs** are **HIGH**—
Let this remind that—

Corrugated Culverts require **LESS** labor than any **KNOWN** Culvert—
(and what they do require can be unskilled)—

That—

Corrugated Culverts are the cheapest to **haul**—and the cheapest to
install of any **KNOWN** Culvert—

And further, that—

Armco Culverts cost are a **KNOWN QUANTITY**—

(It can be definitely pre-determined what an Armco installation will
cost)—

We make the Culverts—you merely place them—

There are no uncertainties—no chances to take—nothing to go wrong.

And further, that—

Armco **Quality** is a **KNOWN QUANTITY**—

RESULTS are **SURE**.

If you want to know more about the thousands of installations that are
KNOWN to have given years and years of service write for

“EVERYWHERE IN THE U. S. A.”



RESISTS RUST

Jacksonville, Florida

Armco Culverts for Permanent Roads

The Dixie Culvert & Metal Co.

ATLANTA, GEORGIA



RESISTS RUST

Little Rock, Ark

AGASCO ROAD BINDER

MAKES ONE MASS OF THE MIXTURE, producing a smooth, resilient, dustless road. First stretch of road laid with it ten years ago, under heavy use daily, still practically good as new.

AGASCO ROAD OIL

seals moisture in concrete roads and prevents drying until concrete is set thoroughly.

AGASCO PAVING PITCH

filler and cushion for brick, wood-block or granite cube pavements—Does not crack, crumble or shrink.

AGASCO Preservative Paints: Number Nineteen (for metal) and Number Fifteen (for wood) protect bridges against the elements.

ATLANTA GASLIGHT CO.

ROOM 232, 14 FAIRLIE STREET, ATLANTA, GA.

The BEST CULVERT For Good Roads

*We sell direct
at Wholesale
Prices*



*Used by practi-
cally all the cities,
counties & town-
ships in the State*

The Point  COST LESS AND LASTS LONGER

Our Vitrified Shale Rock Culvert Pipe will last 50 years—and longer.

All Culverts furnished by us will be replaced free at any time which give away, disintegrate or rust, or otherwise fail when the same have been properly installed according to the usual and accepted manner for installing same.

POMONA TERRA-COTTA CO., Pomona, N. C.

Annual Capacity, 2500 Car Loads



Asphalt Boulevards through Louisiana and Arkansas

The great Arkansas-Louisiana Highway—152 miles long, serving twenty-three cities and towns in the tobacco and cotton belt—will be asphaltic-concrete on a concrete-cement base for 111 miles of its length.

This type of highway which has no superior, was, a few years ago, considered entirely beyond the reach of the country highway builders.

Today these types of pavement

are spreading out in all sections of the country, to the satisfaction of tourists and the economical benefit of industrial users of highways. *Their cost is not prohibitive.*

Highway engineers, contractors, and officials are invited to send for monographs on highway construction, cost, maintenance and repair recently compiled by our engineering department. Free on request.

Ask for Asphalt Brochure Nos. One to Eight.

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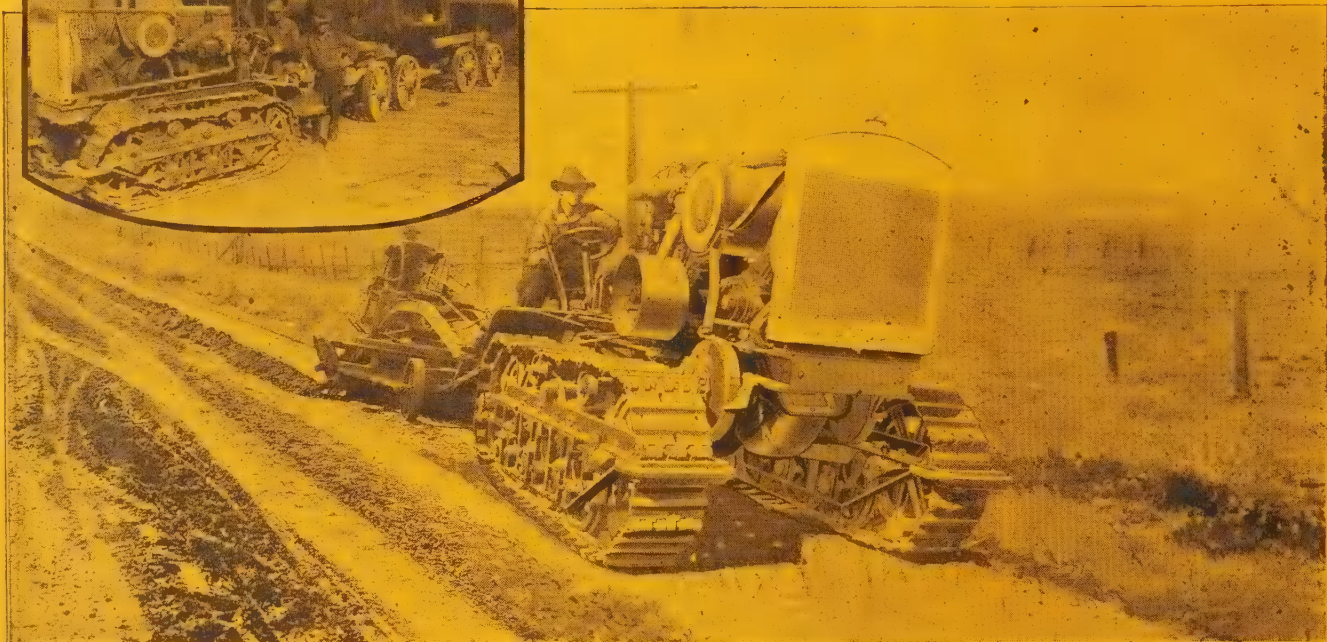
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Asheville, N. C., February 26-28, 1920

SOUTHERN GOOD ROADS

A MONTHLY MAGAZINE
DEVOTED TO HIGHWAY
& STREET IMPROVEMENT

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Lexington, N. C., February, 1920

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Yonahlassee Road on Slope of Grandfather Mountain, Boone National Forest, North Carolina

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Lexington North Carolina

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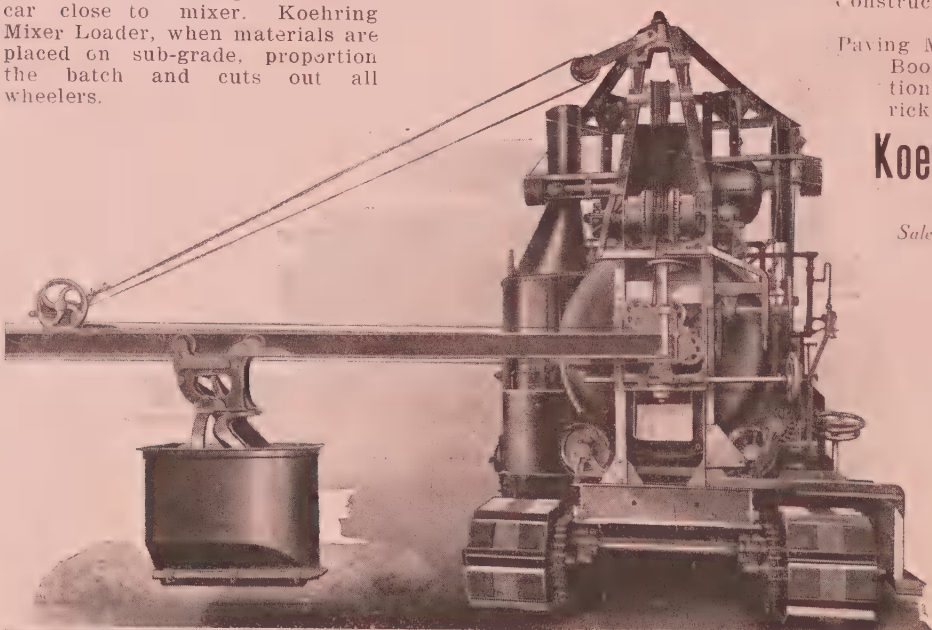
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Federal Road Aid in Eastern National Forests

By JOHN L. COBBS, Jr.,

TANGIBLE results are now becoming apparent from the expenditure of federal funds made available for the construction of roads within and near the National Forests which have been established by the Government in the Eastern States. Several projects of importance are already under way, and others are expected to take definite form in a relatively short time. The work which is planned is in keeping with the policy of the United States Forest Service to develop the National Forests for the benefit of the general public, by making their varied resources available for use as the need and demand arise. The construction of National Forest roads, in whole or in part from Federal funds, is an important feature of this policy and is one of the important benefits resulting from the establishment of the forests.

In the West and in some of the other public land States, as, for example, Florida, the National Forests are well known because they have been in existence for a long time and the results of control by the Government are already apparent; but it is only a comparatively few years since the purchase of lands in the East for inclusion within National Forests was undertaken. In Florida and Alabama, where the title to practically all lands was originally in the Government, the National Forests were created, as they were in the West, by withholding from settlement lands which were better suited for forest purposes than for agriculture. In the other Eastern States, however, the land was granted to individuals either by royal patents prior to the Revolutionary War or by the States since that time, and there are no public lands. It was therefore necessary for the Government to purchase from the private owners such lands as it desired. In most cases the owners have been glad to dispose of the rough, mountainous tracts which are usually located some distance from the railroad and which have little value remaining after the timber has been removed. So-called "Purchase Areas" were established, and up to the present time about two million acres have been either purchased or contracted for.

The policies which have been found satisfactory in the larger forests of the West have been applied to the newly created and smaller forests. Since the Government pays no taxes on its lands, it is apparent that some provision should be made to reimburse the counties and States for the loss of revenue. Consequently

provision was made by Congress whereby twenty-five per cent of the receipts from all National Forests is paid into the road and school fund of the States within which the National Forests are located, for distribution to the various counties containing National Forest land. An additional ten per cent of the receipts is appropriated for use by the Forest Service within the forest boundaries in building roads, trails, and bridges.

These two measures, however, were found to be inadequate to meet the need for roads in the forests, and in 1916 provision was made in the Federal Aid Road Act for an additional appropriation of a million dollars a year for ten years, to be used in the construction of roads and trails within or partly within the National Forests. This money was further supplemented last year when the Post Office Appropriation Act made available for the same purpose three million dollars a year for the fiscal years 1919, 1920, and 1921. Thus, in addition to a percentage of the gross receipts, a total of nineteen million dollars has been appropriated for road building within or partly within the National Forests of the country.

The money made available by the Federal Aid Road Act of 1916 is apportioned to the various States on the basis of the acreage and of the timber and forage value of the National Forest lands within their boundaries. Since the individual National Forests in the East are small, the States which contain them are considered a unit in making the apportionment. The annual amount available for this group of States under the Act of 1916 is about \$23,000 yearly. The six million dollars available under the Post Office Appropriation Act for 1919 and 1920 has been apportioned on the basis of the relative urgency of the need for road construction, and the Eastern States have received liberal allotments.

All roads constructed with money from these appropriations are selected by the Forest Service after a careful consideration of the needs of the forests, and the communities within or adjacent to them. On the larger projects the survey and construction are carried out under the supervision of the Bureau of Public Roads. On the smaller projects the work is directed by the Forest Service.

In handling these appropriations the Forest Service makes every effort to select roads which will contribute not only to the development and utilization of the National Forest resources but also to the good of the



A Mountain Homestead—Good Roads Should Find It.

nearby communities, and many of the projects selected form a part of the general road system of the State.

On the Florida National Forest construction has been started of a road from Crestview, on the Louisville and Nashville railroad to Camp Walton, a resort of no small importance on the north shore of Santa Rosa Sound, near its entrance to Choctawhatchee Bay. Camp Walton is visited annually by hundreds of visitors, many of whom seek relief there from the hot weather of the inland country of Alabama, Mississippi, and Georgia. There are a number of hotels, boarding houses, and summer homes, together with churches, stores, and schools. The development of Camp Walton has hitherto been retarded because it has been accessible only by the boat or by very poor roads. The road from Crestview, a distance of 30 miles, will put the resort in touch with a railroad and make it very much easier of access than in the past. At Crestview connection is made also with the "Spanish Trail," much of which has been constructed, and with other roads reaching northward, so that visitors will be able to come by motor from a number of prosperous towns in West Florida and neighboring States. It is safe to say that the new road will considerably increase the number of persons who visit Camp Walton and other points along the shore, and will result in substantial growth in popularity for these resorts. This road will also be a material factor in aiding the de-

velopment of several other small communities along the route, and will enable lumbermen and naval store operators who are largely dependent upon the timber in the Florida National Forest to market their products much more easily than is possible at present.

An agreement has been signed by authorities of Okaloosa county and by the Secretary of Agriculture calling for the construction of a well-graded, sand-clay road which will meet all of the present needs of traffic. The estimated cost is approximately \$90,000 of which the Government's share is \$43,000.

Another project of considerable importance is known as the "Three States Road" and is located within the Savannah National Forest in Macon county, North Carolina, Rabun county, Georgia, and Oconee county, South Carolina. This is a much needed link in a highway between the Lake Toxaway-Asheville region and South Carolina, and will connect at Greenville, South Carolina, with the National Highway. At Pine Mountain it will also connect with the Clayton-Pine Mountain Road and open up to motorists from Atlanta and South Georgia the beautiful mountain resort region of western North Carolina. The road will be largely used by persons who desire to motor to the Carolina mountains to escape the summer heat, and will be of the greatest importance as well to the local population in hauling supplies and produce. It will facilitate the marketing of the timber and other forest products on some 10,000 acres of Government

owned land within the Savannah National Forest and about 15,000 acres that are privately owned; and it will be of great assistance to the forest rangers in protecting the entire area from fire and in carrying on the business of the National Forest.

The length of the road is approximately 20 miles and the cost is estimated at about \$220,000. A cooperative agreement between the Secretary of Agriculture and the local authorities providing the necessary funds for a careful survey of the route, preliminary to the construction of the road, has been signed. It is hoped that when this survey is completed funds for the contemplated improvement will be available.

Still another instance in which the construction of a road across a portion of a National Forest will result in opening up a through route is found on the White Top National Forest, Tennessee. Here it is proposed to build a stretch of about 12 miles of road on the route from Bristol, Tennessee-Virginia, to Trade, North Carolina, a portion of which is known locally as the "Boone Way." The present road is one which has been in use for many years and serves a large farming community. It is, however, altogether insufficient to meet the needs of the traffic. The proposed new road, for which a cooperative agreement has been signed, will assist in developing the agricultural resources of the adjacent country, a considerable acreage of which has been planted to orchards just coming into bearing. It will also aid in the marketing of timber and timber products from National

Forest lands and in the general administration of the forest.

Such roads as have been mentioned are typical of the class of projects that the Forest Service is selecting under its policy of developing the National Forests and aiding the nearby communities. The fact that the forests are usually located in isolated or mountainous regions where roads are few and far between, and none too good at best, serves to increase the importance of the roads which are constructed with Federal funds.

Important as these roads are from the standpoint of economic development, however, many of them are just as important because they allow tourists to motor into sections of the country which are not heretofore accessible to automobiles, and make possible through travel into the wonderful Appalachian Mountain country. This region has long been a favorite resort for people from all parts of the country. It is the natural playgrounds for millions living in the lower sections of the South and East, and with the development of its own roads and those leading to it, the tourist travel is certain to increase rapidly. The officials of the Forest Service recognize the importance of exerting every effort to encourage this travel. In fact they believe that one of the important uses of the National Forests of the Southern Appalachians and White Mountains is to furnish recreation areas for the population of the nearby cities of the lowlands who desire to escape the summer heat, and they realize that the construction of good roads will do more than anything else to make the forests accessible to these people.



Typical Mountain Road in the Natural Bridge National Forest, Virginia—To Be Improved by the Forest Service With Federal Funds.

America's Road Program

By VICTORIA STEVENSON, In Sinclair's Magazine

A FARMER trying to drive a balky mule over an impassable road! That was the picture which until recently typified road troubles. The road question was regarded as the farmer's problem, because he was the chief user of the highway. The average city man felt justified in eliminating the subject from his worries.

Today the question of good roads is everybody's business. This change of attitude has come about because more than six million automobiles travel the roads, carrying their owners to work or about their business. Every motor-driven passenger car and truck has been a recruiting agent in assembling volunteers in the campaign for better highways. As a result the people of the United States have come to realize that the condition of the highways has a vital bearing upon the food supply, and also upon general industrial prosperity and national security in times of peril.

Since the armistice was signed various state legislatures have voted such bond issues as fifty, sixty, and seventy-five million dollars for road work. Counties too, have voted many millions of dollars for like purposes. St. Louis county, Minnesota, alone obtaining seven and a half million dollars in this way. It has been calculated that in all a fund of more than a billion dollars has been appropriated by such methods.

These large funds, which become available during the next two years, will enable the country to carry on a greater road building program than has ever before been known. Happily, road finances will permit highway officials of many states to plan for the future. Many highway departments will supervise heavier expenditures than any other branches of the state governments.

Some idea of American enthusiasm for good roads will be gained from a reference to Illinois. Besides the sixty million dollars which that Commonwealth will obtain from its bonds, it will receive twelve millions from federal aid, twelve millions from state funds, about three millions from counties through which federal aid roads run and two millions will be spent in state aid roads. Thus eighty-nine millions are available for its highway improvements during the next two years. Highway officials of this state expect the revenues from motor vehicle licenses to pay the interest and the principal of its bonds and leave a large surplus each year.

The Bureau of Public Roads under the Department of Agriculture reports that practically every state is planning a continuous system of connecting roads. This Bureau has large funds at its disposal. From the appropriation in the Federal Aid bill of 1916 there remains over forty-four million dollars which may be used this fiscal year on projects already approved, but delayed by the war. When Congress passed the postal service appropriation bill last February it set aside two hundred million dollars for the improvement of post roads, and nine million dollars for the construction of roads in national forests. This fund was the largest ever established by any gov-

ernment for such internal improvements. As a hundred twenty-five million dollars of this amount is now available, the Bureau of Public Roads estimated that it had in September a working fund of about one hundred sixty-nine million dollars and a surety of a one hundred millions more next July.

Localized effort for good roads has not only been effective in influencing legislatures, but is aiding in actually securing efficient highways. The plan of the Good Roads Association of Greater Kansas City indicates the seriousness with which the road problem is being attacked. This association plans to promote a program for building hard surfaced roads radiating a hundred miles from Greater Kansas City. The program includes twenty trunk lines comprising about two thousand miles, and three thousand miles more of connecting county roads.

It would be difficult to mention all the agencies which have awakened this country to a keen interest in highways. During the war the Council of National Defense, through its Highway Transport Committee gave a decided impetus to the work by encouraging such an enterprise as the rural motor express. Recently, the Department of Commerce urged the building of highways which would answer the needs of interstate commerce. The Department of Labor sent such messages broadcast as "Build Good Roads Now And See How Quickly Good Times Will Roll Down These Roads." The Post Office Department also has been a strong force in influencing national legislation for an adequate highway system. The transcontinental tour of army transports was not merely a spectacular affair. It was undertaken because the War Department realized the supreme importance of good roads in times of war. In part its object was to show by actual experience what could be expected of such a tour. It demonstrated the importance of efficient highways from a military point of view.

The activity of the various departments of government, efforts of state organizations and the energy which road and automobile associations have been persistently exerting for national road improvements, have had a marked influence on the Congress of the United States. During this session more than forty highway bills have been introduced by its members from all parts of the country.

Senator Wesley Jones of Washington, has presented a bill providing for the creation of a Department of Public Works which would have charge of the nation's road building. Senator Morris Shepherd, of Texas, advocates the building of a military highway along the southwestern border. The idea of surveying and investigating the needs of military roads is embodied in several proposals to Congress as well as the actual construction of highways for military coast defense. Representative Robinson of Kentucky has asked that federal aid funds be increased a billion dollars, while Representative Ferris of Oklahoma would add four hundred millions for federal aid work. Several of the Rocky Mountain states favor national legislation allowing them to sell portions of their public lands to supply funds for highways.

Perhaps the most important highway bill now in Congress is the measure introduced by Senator Charles

E. Townsend of Michigan. This proposed legislation has attracted nation-wide attention because it provides for a national highway system of such type as will meet the demands of the future as well as the present. It would create a Federal Highway Commission of five members appointed by the President with the consent of the Senate. Upon this commission would rest the scheduling of the national highway system and its management. It would, in addition, supervise the appropriation of four hundred twenty-five million dollars set aside for the project.

No highway bill has ever been considered more seriously than this one throughout the whole country, because of the enthusiasm for a national highway system. The Chamber of Commerce of the United States is acquainting hundreds of its state organizations and their thousands of members with the Townsend bill because it is drafted along the lines which its committee on highways has recommended. The National Chamber also recommends the continuation of federal aid. Representatives of highway associations are banded together in the Associated Highways of America to co-operate in the scheme of a national truck line.

The American Automobile Association is doing much to arouse the interest of its branch organizations in this cause. Members of the American Association of State Highway Officials are strong in their endorse-

as never before; American roads are being constructed more substantially, and public sentiment is demanding that further progress be made by adopting a national highway system.

Who's Who in Highway Work

By Courtesy of the Highway Magazine

Among the roads constructed by him, which have received publicity, are those at Jackson, Tenn.; Meridian, Vicksburg and Macon, Miss.; Palm Beach and St. Lucy County, Fla.; the cantonment roads and in Chickamauga Park, near Chattanooga.

William W. Cox

William W. Cox, Chief Engineer for the State Highway Department of Michigan, has been secured by the County Road Commission of St. Clair County as Road Engineer-Manager for the county. Mr. Cox is thoroughly competent and fully familiar with the progress of road work, not only in that county but all over the State. He has been in the service of the State Highway Department for ten years.

Upon entering the department, he started as engineer and was soon promoted to the position of inspecting engineer. For two years, when State Highway Commissioner Rogers was Deputy State Highway Commissioner, he and Mr. Cox inspected all the roads in the State under supervision of the department.

Mr. Cox was the first district engineer in the department when the first district was established. This chief and consulting engineer in this class of work

W. P. Moore

Highway Commission, was born at Columbia, Tennessee, November 16, 1870. Columbia has been the home of the Moore family for many generations.

Mr. Moore has made a specialty of highway con-

struction for the past fifteen years, having served as throughout the entire South, representing various States, counties, municipalities and contractors. When he assumed the position he now holds it was with the endorsement of practically all the highway officials and engineers of the South.

Mr. Moore was elected and served as President of the Alabama Association of Highway Engineers in 1914.

was the Kalamazoo district. He remained in charge of the road work in that district for five years and was then called to Lansing and named Deputy State Highway Commissioner. He was later advanced to the position of chief engineer of the department.

A. H. Hinkle

A. H. Hinkle, for many years in charge of the maintenance department of the Ohio State Highway Commission, has been appointed chief engineer in charge of maintenance for the Indiana State Highway Commission.

Mr. Hinkle assumed his new position December 1. He will devote the winter to the organization of the new department, and in the spring will take over the maintenance of the 3,200 miles of highway comprising the State system. The maintenance work will be carried on not only on portions of the system already improved, but also the roads designated for improvement in future years will receive careful attention.

Mr. Hinkle is recognized as one of the leading maintenance experts of the country. His long and successful experience fits him particularly for the work in Indiana.



Section of Road up Mt. Pisgah National Forest, North Carolina

ment of a highway system which would connect all states. Nevertheless, many of these road officials believe it would be a serious mistake to discontinue federal aid.

When it is remembered that the farmer's prosperity is dependent on the roads, it is easy to understand why the National Grange has an especial interest in improving highways leading to city markets; and as no industry could continue prosperous without agricultural prosperity it is difficult to understand how anyone could remain indifferent.

The Federal Highway Council, which has its headquarters in Washington, is represented throughout the United States by large organizations of national importance as well as by commercial clubs, rotary clubs, good road associations and others united in the interests of transportation and traveling in the various states. Many of its members are anxious to see federal aid extended beyond 1921 when the appropriation ceases.

American wealth is being applied to her highways

Bridges, Steel and Concrete

By CHAS. D. SNEAD*

Bridge Engineer, Department Public Roads, Kentucky

Engineers and laymen who are connected with courts, boards or commissions are deeply interested in the cost of bridges, the selection of the proper type of structure, how to secure good work, and what is necessary in maintenance to preserve the present structures and prevent deterioration of future structures. Within the short space of time allotted we can but touch upon the two main types of structures—steel and concrete.

If money is plentiful, the interest rate is low; if houses are vacant, rent is cheap; if labor is abundant, the hourly basis of payment is not abnormally high, and if local materials are available and labor can be secured reasonably, it is evident that the cost of bridge construction is reduced. The cost of bridges is absolutely dependent upon local conditions.

In approximating the cost of any structure, it is necessary first to know as far as possible all local conditions. This information is secured at the time of making the survey and the more time spent in determining true foundation conditions, availability of local building materials, labor conditions, condition of roads for hauling, cost of teams, storage facilities for supplies, cooperation of the landowners, officials and people in general, is time well spent and will be many times repaid to the company, county or State, both in accuracy of the estimates of costs and in the preparation of the final design. Again, before we can estimate accurately,—or for that matter approximately—the cost of a structure, we must have a plan that fits the particular conditions from which to estimate.

There is one element which enters into bridge construction which is often overlooked and yet is of vital importance. Local parties, desiring to make a small fortune at the expense of the corporation, State or contractor will often raise the price of materials and gouge the public and contractor. This is a large reason why contractors will bid high upon the work and why people oftentimes complain of costs. These men were the same highly respected, church going, sanctified citizens who, while professing to be thoroughly interested in public improvement were interested in the improvement only insofar as they could dig into their neighbors' pockets.

Then, gentlemen, the people wondered why the estimate was too low and criticized the engineers for being impracticable or theorists.

In estimating the cost of a bridge, the unit cost of every item must be carefully approximated. For instance, it is not good judgment to say concrete will cost \$15 a cubic yard without basing this figure on local conditions. The cost of cement delivered, the cost of sand, stone or gravel, labor, the cost of form lumber, together with a knowledge as to whether this could be again used, the cost of excavation, the cost of finishing and protecting the work and the cost of hauling—all of these must be carefully estimated and finally a reasonable profit must be figured for the contractor. When this is done for all items, then without great discrepancies we should be able to approximate

the cost of a structure if we know the quantities involved.

It should be remembered if structures built of steel are properly maintained there is no reason why they should not last for thirty or forty years, perhaps longer. The public has been fooled so long by the old time representatives of bridge companies about the capacities of bridges that many officials, and engineers, too, are at sea and believe the statement that the plans of State Departments are designed for too heavy loads and weigh too much. What man fifteen years ago would have predicted the present highway loads? What man among you dreamed then of fleets or five ton trucks, each when loaded to capacity weighing ten tons and which, by actual weight, have been often found to be fifty per cent overloaded? What man of you can definitely state that in the life of your bridges no such loads will ever be of frequent occurrence? No man can make such a statement without a large probability of being badly reversed in years to come. Again, gentlemen, the extra weight in the State spans doesn't all come from the live load they carry. No one doubts but that the old type of wooden floor is doomed. At best, wooden bridge floors are expensive and costly to maintain. We know concrete is heavier than wood and naturally requires more steel to carry this added weight. But there is added weight to the State plans to add to the life of the bridge, added years of service at a very small first cost by the elimination of poor details, thin plates; yes, plates thinner than one-fifth of an inch—details which if neglected rust out and destroy the strength of the whole structure.

There is a parable in the Good Book about the wise man building his house upon rock while the fool built his upon sand. This is applicable today in the sub-structures of all bridges and there are many men in responsible charge of work who not only are wholly ignorant of the design of masonry abutments and piers and foundations, but who gloat over their ignorance and term it as "practical." They build year in and year out abutments founded on sand, mud, soapstone, blue clay, and so on, too thin to stand and give service even if founded upon solid rock. These structures stand as monuments to their judgment sometimes for five years, sometimes longer, but more often less, and then—without warning perhaps—fail; proving again that it is the exception which proves the rule. In fourteen years experience I do not remember of more than about one dozen structures in which the sub-structure when properly designed and placed did not more than exceed the cost of the superstructure. The first costs of bridges can be cheaper by defying the laws of nature, by omitting piles and not securing the proper foundations and at the same time the treasury can be depleted in the rebuilding and maintenance of such structures.

There is one point upon which too much emphasis cannot be laid. The first cost of a bridge should not govern its type; that is, whether the structure is to be of steel, concrete, or wood. Structures must be designed and constructed not only with sufficient carrying capacities to care for modern traffic, but also so

*Abstract of paper delivered at Kentucky Highway Engineers' Convention, Owensboro, Ky., November 14, 1919.

that the yearly maintenance charges will be a minimum. This cannot be determined without estimating the maintenance charges. In general, it will be found, for spans up to forty feet, unwise to construct them of steel when the permanence of concrete is considered. This does not mean that longer bridges made up of short spans may not be economically constructed of concrete, nor that concrete arches should not and must not be built for the longer spans. Maintenance costs vary greatly. They depend upon labor, local material for bridge floors, the kinds of structures, nature of the stringer, whether wood or steel, and other factors. For these reasons, each case must be decided upon its merits and while much data has been collected regarding such costs, this data has not been so arranged as to be of general application under varying conditions. With a wooden floor and steel stringers, an allowance of five and three quarter cents per year per square foot of structure will not prove excessive and this should at all times be added with interest compounded in estimating the final cost of a steel structure and then the life of the steel structure should not be estimated over thirty years in comparison with concrete with a life based at fifty years.

Just a few words about maintenance. Concrete bridges require practically no maintenance but must be inspected to see that there is no scouring action, to see that the cushions have not worn through and that drain holes are open and operating. These things should be attended to immediately. The tops of concrete structures should always be finished off smoothly without pockets to hold water and should be sloped or rounded to drain it off. This will prevent the water standing on the structure causing the cushion to become muddy and also prevent the water from being absorbed by the concrete.

Steel structures must be regularly inspected. If spots need cleaning and repainting this should be done and possibly for a period of a year or more repainting the entire structure may be delayed without damage to the structure. When repainting is necessary, do not allow your structure to continue to rust through the idea that the money can be saved until another year. You are paying dearly in interest in the life of your structure. Have your structure thoroughly cleaned before repainting and use only the best paints for your work.

Inspect your bridges with concrete floors and see especially if they are the arch type of floor commonly found in this State, whether or not they have not punched through. If the structure contains a wooden floor inspect closely for decayed planks. Decay is a disease and will travel from one plank to the other if they be in contact and neglected. Do not put concrete floors upon bridges designed for wooden floors; they are weak enough already no doubt for modern traffic. Inspect abutments for movement and if movement is taking place, get an engineer to advise you what to do. Evidence of movement may be indicated by buckling hand rails or bottom chords or by the pier or abutments leaking.

In conclusion, if bridges are designed of equal should be remembered their costs will be approximately identical. When you cheapen your first cost be sure strength according to the same specifications, it that you have not lessened the strength nor the durability of the structure. It is possible to reduce the cost of structures by temporary or make shift abutments which surely will fail in time. It is possible to put in thin metal and poor details and reduce the

cost at the expense of the life of your structure and it is possible to reduce the safe-carrying capacities of spans and eliminate cost. None of these can be recommended. If your structures seem bargains, it is well to see from what portion the moths have taken their meals.

Officials of the North Carolina Good Roads Association Hold Important Executive Meeting.

An important meeting of the Executive Committee of the North Carolina Good Roads Association was held in the Yarboro Hotel, Raleigh, North Carolina, recently.

After careful consideration the members present voted unanimously to continue its campaign for a State system of hard surface roads connecting county seats and principal towns. Such a system would cover approximately 5,000 miles and will involve an expenditure of \$10,000,000 a year for a period of ten years. Reports read from all sections of the State indicate the very strongest sentiment throughout the State for the construction of hard surface highways and the completion of a State system. The program as outlined by the North Carolina Good Roads Association will call for real constructive statesmanship on the part of our legislators; but officials of the Association point to every other progressive State as evidence that quick action is necessary if we are to keep pace with these States. The farmers and merchants of every county in the State are demanding good roads to meet the needs of motor vehicles.

The Association advocates an ad valorem property tax supplemented by serial bonds sufficient to yield \$10,000,000 a year, this money to be used in the construction of the State highways. The automobile license fee should be used exclusively for maintaining the State highways. It was pointed out that such a program would relieve the counties of any part of the construction or maintenance of the main State highways and would allow the county commissioners to use their funds in building local roads which will serve as feeders to the State highways. The present road law was declared wholly inadequate to meet the State's needs.

The Executive Committee decided that in view of the urgent need of more constructive legislation that it would not be amiss to have the acting secretary communicate with the Governor to ascertain if any road legislation would be sanctioned at the special session of the General Assembly.

Mr. W. A. McGirt, President of the Association, presided, and Miss H. M. Berry acted as secretary. The members of the committee are: Messrs. W. A. McGirt, of Wilmington, ex-officio chairman; W. C. Boren, of Pomona; T. L. Gwyn, of Wayensville; P. C. Whitlock, of Charlotte; Hugh MacRae, of Wilmington; H. D. Williams, of Kenansville, and Joseph Hyde Pratt, of Chapel Hill.

Reports were made by the acting secretary which showed a remarkable growth in membership of the Association, an increase in the last two months of over a thousand members. Owing to the remarkable growth of the Association and the interest generally in good roads, it was decided that the Association employ a full time secretary and enlarge the working field force.

Prior to the adjournment of the meeting Asheville, North Carolina, was selected as the 1920 convention city, the annual meeting to be held in June.

Virginia's National Responsibility

By G. P. COLEMAN

Virginia Highway Commission

AT A MEETING of the Virginia Good Roads Association, in Richmond, Va., January 14, Mr. G. P. Coleman delivered the following address on the work of the Virginia Highway Department and its work:

It is always with a sense of pride and pleasure that I greet you gentlemen of the Virginia Good Roads Association, with pride, for I recall the first meeting, when some thirty-odd of us foregathered and organized this association; and with pleasure, for I have seen that number grow to many hundreds, representing, as you do, the varied and many interests of this grand old State.

To form a highway program for Virginia, or properly to understand the progress of highway work in the state, it will be necessary to divide the subject into two heads:

First: What has already been accomplished, and its bearing on the future development of our work.

Second: What is to be done and how we are to accomplish the best results in the shortest time. Each of these questions naturally resolves itself into sub-heads, under which I believe we can bring out the conditions which actually exist, and then outline the work which we hope to accomplish.

First, the State in 1906 embarked on its highway program under its Withers-Lassiter act, using prison labor in highway construction. In 1908 they enlarged this program by appropriating money aid to be distributed to counties which could not receive convict labor. Under the acts of 1904 counties were allowed to issue bonds for highway construction. This act was further broadened in 1910 by permitting Magisterial Districts to issue bonds for the same purpose. The revenue derived from the automobile license fees was added to the state money aid to counties in 1910 and later segregated to maintenance.

Under these laws, the counties have issued approximately \$11,000,000 in bonds and there is remaining unexpended about one and three-quarter millions. Proceeds from this source, together with state money aid and convict labor have been used in the construction of 5,500 miles of road; a mileage 50 per cent greater than the present proposed state highway system.

This construction, however, has been divided up into short sections of highway, scattered throughout the one hundred counties of the state. The selection of these sections was made without a definite plan in mind, and the consequence is that even with this large road mileage it is impossible for a citizen of one section of the state to travel with comfort to any other section. As a matter of fact, many sections of the roads constructed in the early period of the state highway commission have been allowed to deteriorate and go to pieces, by those in authority, for lack of the proper realization of the importance of maintenance.

This condition, then, brought home to us in 1914 the sense that if we were to accomplish a real and lasting work for the state we must have a definite policy—something which would get us away from the haphazard mode which we were then following. The way for this was made comparatively easy for us be-

cause of the requirements of the federal aid act which was then pending in Congress, as one of its chief requirements was that a State, before it could receive federal aid for highway construction, should have definite highway plans. Anticipating the passage of this act the General Assembly of 1916 appointed a committee to formulate such a plan, and to recommend a policy, together with the necessary laws to make them operate. This they did to the General Assembly of 1918, which established your state highway system of 3,750 miles of main highways. It also required that the board of supervisors of the counties should lay out and establish county highway systems as feeders to the main state system; the boards to select each year sections to be improved.

They further provided that the state highway system should be constructed and maintained by the State, making a small appropriation which together with the revenue derived from the three-tenths mill tax was to be used in beginning construction on the state highway system. They also set aside the revenue derived from the automobile tax for the maintenance of the state system; and at the same time segregate prison labor for construction, maintenance or resurfacing on that system. For the county highway systems they provided an appropriation of \$300,000 to be distributed to the counties, and met by an equal amount, for either construction or maintenance purposes.

The extra session of the General Assembly which convened in August 1919, in order to meet the national aid, increased the three-tenths mill tax to a one mill tax, also increasing the automobile tax fifty per centum, these increases to be used for resurfacing or construction. It was also their intention to appropriate, from funds derived from other sources a sum sufficiently large, which, together with the funds derived from the above sources, would be sufficient to meet federal aid. This additional sum is being carried in general budget of the State for this year. They also made an extra appropriation of \$400,000 as state aid to the county systems.

One of the most important changes made at the extra session was in the duties of the newly created state highway commission, a body of five men, selected from the different sections of the State by the Governor; the chief duties of this commission will be to act as a board of appeal from the decision of the state highway commissioner on the location of highways, and to confer with the commissioner on the allocation of funds.

To sum up, then, we have arrived where we have on paper county highway systems, which have been partly constructed in bits, the results of the conflicts of five hundred and forty-odd minds, sometimes working in as many directions, but some of them frankly making a great effort to co-ordinate these various systems and to bring into existence a comprehensive plan. A state highway system, also on paper, sections of which have been more or less improved, but all of which requires construction or reconstruction to carry the traffic which will ultimately go over it.

For the construction of this system we will have available a part of the funds from the national gov-

ernment, the revenue from the one mill tax, the revenue from the increase of the automobile tax, and special appropriations carried in the State's budget, and such prison labor as can be satisfactorily utilized on this work. From all of these sources we will have approximately ten millions of dollars, covering the next two-year period. In addition to this, we will have for the maintenance of the state highway system that part of the automobile tax segregated to maintenance and such prison labor as can be utilized for maintenance and resurfacing purposes, which amounts to approximately two millions of dollars for the two-year period.

On the county system we have for construction or maintenance, \$400,000 appropriated by the extra session and \$314,944.31 of old appropriations, making a total joint fund of \$1,429,888.62 which we understand is to be further supplemented by the present General Assembly, which amounts will also be available in 1921.

During the past year, we have constructed on the state highway system, approximately 125 miles of road, a part of which was paid for entirely by the war and navy departments. We have under way at the present time thirty-three contracts, representing a mileage of 145 miles, with plans and estimates under way for thirty-three projects, representing a mileage of 225 miles. The greater part of this we hope to let to contract in the next sixty to ninety days.

On the county system we have constructed 205 miles, at the same time maintaining some 2,300 miles of highway.

We have in the tentative construction program, which was issued by this department early in Novem-

ber, many sections of the State highway system, scattered throughout the different parts of the State. From a cursory examination of this program you may jump to the conclusion that this is but carrying forward the original lack of policy of the State in the infancy of the highway movement, but these allotments were made after careful consideration of the situation as we see it, deliberately and intentionally; some of them placed to save investments already made by the counties, some to connect up improved sections of the system, and some to strengthen and crystalize the road sentiment in communities—all of them made, having in mind that big highway program which will be necessary if we are to keep abreast of other states and develop our wonderful resources. The foregoing appropriations are a long step in the right direction, representing, as they do, something over ten millions of dollars; a handsome sum, until you consider the magnitude of the work ahead of us, then it seems almost infinitesimal.

How then, you ask, are we to finance the construction of the roads of the State? There are several very natural suggestions which immediately come to mind.

If we are to secure intelligent planning in the highway development of our country, it will be necessary for the national government to realize its responsibility in this matter and undertake to lay out and establish a national system of highways; this to include the main arteries of travel of the country at large, and to carry on and develop interstate commerce, these roads to be constructed and maintained entirely at the expense of the national government. I am convinced, from the general discussion of this question which is going on throughout the country at the present time,



Such Roads Retard Development in the Southern Mountains. Those in National Forests Are Being Improved Rapidly.

that the realization of this part of our program is in the not very distant future. However, this probable development must not tempt us to hold back in the consummation of our State highway system, even though we may be reasonably sure that certain routes in our system will be made a part of the national system, for just as sections of our State system were improved through the initiative of the more progressive counties and form for us the nucleus of our system, and as these improved sections became potent factors in the selection of some of the routes forming that section, just so will the advanced attitude of the several states become a powerful influence in the welding together of a great national system. I think we can rest assured that the greater the development of our State system, the greater will be the mileage taken over and included in the national system. Further, we can richly afford to construct our own highways by our own initiative and enterprise, if we can induce the national government to take over these highways after their construction and maintain them. This will relieve us of a tremendous burden and will release to us funds which can be utilized to very great advantage in the further development of our state and county system. Any national plan adopted will include at the very lowest estimate from one-fifth to one-fourth of our present state system.

While we can feel reasonably sure that the national system is not very distant, we cannot afford, as stated above, to base our program on its development. It is therefore necessary that we should work out our plans, having the foregoing possibility in mind. As I outlined to you in opening, we indulged in the state highway system some 3,750 miles of main highways. While some of this mileage has already been constructed, the changes in traffic conditions have been so rapid in the past few years that it will necessitate the resurfacing and rebuilding of the greater part of it.

Our plan, then, should include of the raising of from sixty-five to seventy-five millions of dollars, to be utilized, if possible, in a six-year period. The highway department as at present organized will be in a position, as soon as this fund could be made available, to expend from eight to ten millions the first year, ten millions the second year, twelve millions the third year, and fifteen millions each succeeding year, or a total of the above amount in the six-year period. Of the above amount we are receiving at the present time from the federal government, two millions of dollars annually. I have reason to believe that this amount will be materially increased during the next year. I feel confident that when the national government undertakes the construction of its highway system, it will continue its aid to the States, to be used in the construction of the State highway systems.

This, however, will leave a large amount to be raised annually by the States. There are but two ways, as I see it, to raise sufficient funds. One by a special tax, and the other by a bond issue, or you could have a modification of either one of these plans and raise part of your funds by special tax and part by bond issue. The first I think we will agree is out of the question, since at the present time our one mill tax is yielding us approximately \$1,300,000. From one-third of the automobile tax we will derive in the neighborhood of \$500,000, or by the time we could issue bonds we would receive from these two sources approximately \$2,000,000, which, in connection with the federal aid, would give us \$4,000,000 annually. Our problem, then, resolves itself into the amount

of bonds to be issued annually, and the arrangements which should be made for interest and sinking fund. I wish to emphasize here the importance of always having in mind the maintenance of our roads after their construction. This should be demanded of us by the citizens of the State who are to pay for the construction of our roads, for only in this way can we assure to them the benefits of the investment which they are to make.

I would therefore recommend:

First: That first consideration should be given to maintenance of the highways after their construction, and that adequate funds should always be provided for that purpose.

It would further be advisable that the whole of the State highway system should be taken over for maintenance, since in many sections the county authorities feel that as unimproved sections in this system will ultimately be improved by the state that therefore the county should not expend their funds for maintenance purposes. To do this, however, the General Assembly must provide the necessary funds for maintenance.

Second: That plans should be immediately made for the complete survey and establishment of the State and county highway systems, which will greatly facilitate future construction and decide for all time disputed or uncertain locations, and that the right of way for the State highway system should not be less than fifty feet.

Third: The appointment of a committee to formulate a financial plan for the construction of the State highway system, and for State aid to the county highway system, taking into consideration the possibility of the establishment of a national system, the issuing of bonds or the levying of a special tax, or both, and the anticipation by the counties or otherwise of State funds in the construction of the State system.

Fourth: That, if the State is to continue its present policy of aiding the counties in the construction of county highway systems, the counties should be required to maintain these roads after their construction, and that some definite plan of construction should be agreed on between the State and the counties, in order to co-ordinate this work.

Fifth: That, to meet the ever-growing needs of that State, for its proper development and future up-building we go on record as favoring an early constitutional convention.

From the foregoing, you will realize that you, as citizens of this State, are embarking on the biggest business venture ever undertaken by the State; a business which will represent the expenditure of many millions of dollars.

There are many of you here today who are confidently expecting the construction of the section of road either immediately in front of your place or on the road which will lead directly to your place. You must, however, realize, on careful thought, that this will be physically impossible and that the construction of the State highway system is going to take time as well as money, and that therefore you must be patient.

As head of the department having this work in charge I ask you to give it your most careful consideration and, if possible, your support and co-operation. You will finance it and you are therefore the stockholders and should give it your time and thought. I realize that it is the public's legitimate right to demand the greatest efficiency in its highway development, but I feel that it is also my right to demand

your definite cooperation in securing this development. It is only in this way, where there is a full understanding and a willing co-operation, that we can expect to derive the greatest benefits from the investments which we are making.

Therefore when we build, let us think that we build forever. Let it not be for present delight, nor for present use alone. Let it be such work as our descendants will thank us for, and let us think, as we lay stone on stone, that a time is to come when those stones will be held sacred because our hands have touched them, and that men will say as they look upon the labor and wrought substance of them, "See this our fathers did for us."

1919 a Record-Breaking Year in Texas Highway Construction

No previous year will begin to compare with that of 1919 in the matter of amount of money expended in Texas for the construction of highways, says a dispatch from Austin. It is shown by the records of the State Highway Department that for the eleven months to December 1 a total of \$80,457,000 bonds had been voted by counties of Texas, the proceeds used and to be used in the construction of good roads. In addition to this enormous sum already voted, bond issues for the same purpose amounting to \$33,568,000 are pending and under consideration. Added to the total amount of bonds voted by counties is a fund obtained from automobile and other motor vehicle licenses amounting up to December 1 to \$1,381,308.76, and a Federal good roads fund of \$10,175,806.31 for the years 1919-1920. The total number of automobiles registered for the eleven months was 323,235, an increase of 72,177 over the preceding year.

Construction of highways in Texas during the last several months, it is added, has been greatly retarded by long periods of unprecedented rains a general shortage of labor. Many counties, however, have purchased good roads equipment in the way of tractor engines and graders, and are prepared to carry on an extensive program of improvement during the next several months.

The proposition of amending the constitution so as to authorize the issuing of \$75,000,000 bonds, the proceeds to be used in building good roads, was defeated at the recent election, but this has not deterred the different counties from voting bonds for the purpose.

Home-Made Road Surfacing Machine

A combination of a spiked-tooth harrow, a drag and a smoother or slicker has been invented by D. H. Winnslow, State Maintenance Engineer of the North Carolina State Highway Commission. The use of tractor-trucks in pulling the planer saves both man and mulepower, inasmuch as formerly it required three teams and implements to do the work now accomplished by this home-made device.

The stipulations herewith given for constructing the home-made device are not arbitrary and if mules are used instead of tractors the dimensions can be reduced: An old machine blade or tire iron can be used on the third timber. The spikes can be any length over eight inches and will last longer if case-hardened. Old railway ties can be used instead of sawed timbers. One of the planers in use in North Carolina was constructed at a cost of \$15, and the cost \$25. Spikes 1 1/4 inches have given the best

results. Any carpenter or blacksmith can make the maximum expenditure for the device should not ex- planer. Its form of construction enables it to span the depression and cut the high spots on the road surface. It only strikes the bumps and waves of the road and does not follow the surface if uneven.

It was designed for rural highways exclusively. Not taking into account the work of the split log drag, little highway improvement has been accomplished for rural sections where funds are limited and mileage excessive.—S. R. Winters in the Scientific American.

Col. Jim Maret Takes Flight With Daring Birdmen

"Up in a balloon boys, up in a balloon, Rustling among the little stars sailing around the moon," a familiar song of half century ago, was forcibly recalled to the Boone Way Man's mind, in the afternoon of Saturday last when he "took to the air" in one of Eddie Stinson's Curtis airplanes, from "Crawford Field," two miles north of Winchester. This trip thru space was the culmination of dreams which the old road scout has had since his early childhood days.

Strapped into a seat to the rear of the pilot the passenger announced "ready." The propeller's speed was increased and the machine moved swiftly along the ground then climbed into the air circling around over the hundreds of spectators below who had gathered to view or take rides towards the clouds. After climbing 4,000 feet, a bee line was made for Winchester over which place the machine made circuits. Houses looked small and the streets very narrow and the people could scarcely be seen except where they were in crowds.

Roads which have been reconstructed in Clark county, under the supervision of Boone Way Man, were observed from various altitudes, sometimes they appeared no wider than an inch or two.

Incoming trains were seen out a number of miles coming in from Lexington over the L. & E. and from Cincinnati over the L. & N. Automobiles moving along the roads, at possibly thirty miles an hour, seemed to only be crawling. Horses appeared to be the size of an ordinary cat.

After a most thrilling and delightful air excursion the machine landed the old road builder at the starting point, "Crawford Field."

How does one feel up in an airplane? Well, the Boone Way Man enjoyed his trip to the fullest. Not a tremor of fear or worryment was his. It was one of the most exhilarating and enjoyable experiences in his long life, and he's ready for a longer spin the next time he "goes up into the air."—The Virginia Motorist.

Municipal paving contracts aggregating \$263,619.73 at Jacksonville, Florida, were awarded recently to J. Y. Wilson of that city. Various streets and avenues are to be paved with vitrified brick on concrete base and vitrified brick on cement and sand, with granite curb.

The North Carolina Highway Commission has authorized the construction of the Lenoir county section of the Central Highway; the cost will be \$705,000. This road will be 20 miles long, with sheet asphalt surface. The H. Gill Company, Binghamton, Tennessee, has the grading and draining contract at \$135,000, while the asphalt surface will be constructed by the West Company.



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TALKING VERSUS BUILDING GOOD ROADS

It is our belief that the majority of the people of the Southern States are awake to the necessity of enforcing a liberal policy for improving the public highways. It is our conviction that their state of mind is quite favorable to progressive steps in highway work, a state of mind which is indeed gratifying to those who have talked, and talked, and talked good road doctrine for over a decade. We believe the time is ripe for the prosecution of great constructive programs. We have come to the point in the good roads movement where we must either go forward or backward, and to go forward we believe the several States of the Union should make provisions for matching dollar for dollar the money which Uncle Sam is offering. The chief difficulty in the way of the normal, rapid highway construction in most instances is that the state authorities have not the funds necessary to take advantage of the liberal aid which the Federal Government has to offer. And it is greatly to be desired that the several General Assemblies at their next session make provisions to meet the situation.

The ever-increasing motor traffic, the necessity for a better and quicker method of hauling the products from rural districts to town and to the railroads, and enlightened public opinion demand that we go forward.

It is always in order to talk good roads, but we should not become so interested in the conversation that we forget to build.

THE PSYCHOLOGICAL EFFECT OF GOOD ROADS ON THE COMING GENERATION

It has been said that environment is the greatest influence in one's life, and we believe that it is true. A person's entire life is moulded by that person's childhood environment, true enough the casting is not finished in the early stages of life. The finishing comes later and is generally of an acquired nature. If the

rough casting is not good, however, as rough castings go, there is no foundation for the finish or polish that is necessary in the rounding out of a well-poised and useful human being. Many citizens realize the necessity of teaching the younger generation about the beauties of Nature, because they themselves have been taught through different mediums of child-training that wholesome knowledge instilled into the plastic mind of the child lays a foundation that will some day form a base for a structure of wisdom necessary in order to cope successfully with the problems of life. Communing with Nature is no doubt a great factor in the correct training of a child. It was our privilege to be brought up by parents who believed in using botanical illustrations in the training of the young mind; but in order to reach the class-room, which was a large forest some distance from our home, it was necessary to traverse a mile of the poorest road imaginable. The result was that the teachings lost a great deal of their value, for even now the most outstanding memory that we have of them is the muddy shoes and the resultant cleaning after each trip.

The good roads question is many-sided. Some of the sides have been so much discussed that in written articles the title is the extent of the average perusal. We believe, however, that the side referred to in this article is of great importance and is worthy of the thought of well-meaning citizens. We should incorporate good roads into the environment of our children. To do this, more roads must be built; those we have must be maintained; a community pride in roads must exist; and the importance of good roads must be taught in the schools. By doing these things now we will not only be instilling into the coming generation a love for things worth while, but we will be laying a foundation for future road improvement that will be the keystone of national growth.

The Spirit in Which the Nation Must Build Highways.

The educational advancement of the country will be halted by the ruin of country schools

Without Good Highways.

The religious and moral advancement of the country will be stunted through the destruction of country churches

Without Good Highways.

The food supply of the nation will grow steadily less and prices steadily higher

Without Good Highways.

Farm life will grow less and less attractive, and the energetic young people will continue to rush from country to city, which is even now endangering the civilization of the nation,

Without Good Highways.

The transportation problems of the country are growing more and more acute; our railroad system is practically broken down. More than \$10,000,000,000 should have been spent upon railroad expansion in the last ten years to have kept the railroad facilities equal to the growing needs of the country. The transportation situation will become more and more dangerous to the welfare of the nation

Without Good Highways.

Every industry of the nation, its educational, moral,

and religious advancement, its food supply, which takes hold directly of every man's welfare, will suffer irreparable damage unless we enter upon a highway building period by comparison with which even all the highway construction work now planned will sink into insignificance.

Individuals paid out last year for automobiles and motor trucks, tires and accessories about \$2,500,000,000, and some automobile makers claim that the sales in 1920 will be twice as great as in 1919. It seems safe to estimate that the total in 1920 for automobiles, motor trucks, tires and accessories will aggregate nearly \$4,000,000,000.

The amount spent by all the counties and States and the National Government for the building of highways over which automobiles and motor trucks will run figures up to but a beggarly percentage of the vast sum spent for these great additions to the nation's business activities.

Five times as much money is being spent for automobiles and motor trucks and tires as is being spent for the expansion of railroads of the country.

Five times as much is being for these things as will this year be expended on all the highway work in this vast country. It is true that the amount projected for this year is a little larger than that one-fifth would be, but it is hardly possible that arrangements will be completed by which the total amount available will be put out during the year.

The counties, the States, and the Federal Government must carry on highway work commensurate with the meaning of highways to civilization and with the magnitude of expenditures that are being made, through automobiles and motor trucks, for increasing the transportation facilities of people and things.

The railroads cannot possibly catch up with the growth of the country. They are ten years behind time.

Neither Government ownership, with all the financial backing of the nation, nor private ownership, with all the energy and the capital which the great financial interests of the country can throw into railroad expansion, can within the next ten years bring the railroads up to the degree of efficiency which will be required.

The magnitude of the passenger and freight traffic is growing far more rapidly than it is possible to build railroads and expand existing facilities.

In 1906 the Manufacturers Record, in a carefully prepared statistical statement, showed the inevitable breakdown of the railroads of the country by 1916 through a growth of traffic which would far exceed the growth of their facilities unless there should be a vast expansion of railroad work.

That prediction was fulfilled.

The only possible light upon the transportation situation which can now be seen is the extension of motor truck and automobile facilities rapidly enough to lessen the strain on the railroads to meet the growing needs of the country. Imagine for one moment the chaos which would exist if there were no automobiles and no motor trucks anywhere in America to lessen the pressure upon the railroads for passengers and for freight. The situation would be inconceivably bad.

The growth of the railroads cannot be made rapid enough to meet the conditions which are ahead of us.

The automobile and motor truck have taken rank among the outstanding influences of the world. They mean to the advancement of civilization fully as much as the first railroad meant in human affairs. Their

growth surpasses anything that the world has ever known in any other industry, and yet every student of affairs is compelled to recognize that the automobile and the motor truck are still in the infancy of their usefulness.

The highway of the most modern construction, capable of standing the severest motor truck traffic and of sufficient width to justify practically any density of traffic, becomes to the country today more important than was the building of our vast railroad system.

Until we build highways far out into the country, and connect up practically the entire farming sections with the nearest markets, we shall not be able to stem the rush of population from the country to the city. The danger of this trend away from the country, which is causing city population to increase four times as rapidly as country population, does not yet seem to have been fully understood. The individual boy or man, finding that he can do better for himself financially in the city than in the country, rushes to the city for employment. He becomes a consumer of country products, whereas when on the farm he was a producer. The number of these consumers is growing so rapidly that the nation must soon face the problem of how to feed city population. In olden days, before this trend was pronounced, roads everywhere were bad and city conveniences had not been fully developed. Farm life had about as many comforts and attractions as the city, but when we entered upon a marvelous industrial expansion which changed the whole character of the nation and, indeed, of the world, we entered a new epoch. We must meet its problems.

Standing out far and above all other issues is the one dominant question of good highways as the factor in keeping people in the country. If country life is made as comfortable and attractive to country people as is city life, we shall lessen the movement toward the cities. Until we do this, we cannot hope for any increase in food products.

Highway building is one of the supremest issues before this country. Upon it rests to a large extent the Socialistic and Anarchistic unrest, based to some extent on the scarcity and high prices of food or on a better living condition for people everywhere through the adequate development of agricultural activities resting on good highways. As the country church cannot live in the old half-dead way of the past, shut off by mud roads in the winter and almost impassable sand in the summer, neither can the country school longer live to do its duty if the children are hurried by the all-compelling influence of the hour away from the farm to the factory and the city.

The man who does most for the advancement of civilization outside of the actual preaching of the Gospel will be the man who most largely helps to develop a spirit of building highways and who does the most to carry out the actual building of these highways.

The highway builder, therefore, becomes a missionary of the Gospel, a missionary for education and a missionary for better social conditions, and his influence will be tremendously helpful in putting the whole nation on a higher plane of religions, moral, and material progress than it has ever known in the past.

Let the nation build highways in this spirit.

—Manufacturers Record.

Tentative plans have been made for two steel bridges across the Caddo at Glenwood, Arkansas, in addition to the \$100,000 bridge to span the river as a part of the Bankhead Highway.

Good Roads Material Abundant in Arkansas

Statement By Arkansas Engineering Society

ROAD building materials testing above the requirements for the highest types of present day construction may be found in practically all sections of Arkansas, according to a statement prepared by the Arkansas Engineering Society, of which Hugh R. Carter, former engineer of the State Highway Department, is president. The statement discusses at length the essential points in road construction, and gives other valuable information relative to materials. It follows:

Large quantities of excellent road building materials are to be found in all parts of the State except in the eastern tier of counties or in the section which may be more definitely designated as the alluvial lands of the Mississippi river and its tributaries. These materials grade all the way from arenaceous shales up to the hardest kinds of trap and of granite rock.

In discussing good roads and the materials to be used in their construction it is necessary to first define the character of road under consideration, because in those parts of the State where they have little more than bridle paths a good road is simply a common dirt road shaped up to follow reasonably good grades and alignment; while here around Little Rock a good road means concrete base with asphaltic wearing surface.

The public roads branch of the United States Department of Agriculture has published certain valuable bulletins covering good roads construction and the following quotations are taken from No. 370:

"Traffic divides itself into two classes, (a) horse-drawn vehicles and (b) self-propelled or motor-driven vehicles. In the former the impact of horses' feet tends to disturb the position of individual fragments of rock in the wearing course and also to fracture the rock. At the same time wheels, especially steel-tired wheels, not only exert an abrasive action which grinds away the rock surfaces, but tend to crush the fragments of rock in proportion to the load per unit width of tire."

"Automobile traffic exerts a severe shearing action upon the road surface which tends to loosen the individual fragments and, ultimately, to remove them from the road. Where chains or armored tires are used, considerable abrasion may also result, especially under those conditions which favor slipping or skidding.

"Climatic Agencies—So far as the rock itself is concerned, climatic or weather conditions are not important destructive agencies. While it is true that rain and surface waters gradually dissolve or react with certain rock-forming minerals, the action is so slow as to be practically negligible as a source of deterioration during the life of a road. Frost may cause some deterioration in the more porous types of rock, but both rain and frost are more destructive to the road structure than to the rock of which it is built. Wind also is a negligible factor so far as the rock is concerned.

"Faulty construction may result in rapid deterioration of the road proper due to a number of causes, such as poor drainage, lack of proper consolidation, the use of the wrong size or wrong grading of broken stone, etc. Destruction or disintegration of the frag-

ments of rock may also be hastened by these errors in construction.

"The success or failure of a rock for road building depends largely upon the extent to which it will resist the destructive influences of traffic. The three most important physical properties are hardness, toughness and binding power. Hardness is the resistance which the rock offers to the displacement of its surface particles by abrasion; toughness is the resistance which it offers to fracture under impact; and binding power is the ability which the dust from the rock possesses, or develops by contact with water, or binding the large rock fragments together."

The laboratories have devised a system of testing, approximately as closely as possible the destructive effects produced on a road by the various agencies; briefly described the tests are made in the following manner:

Hardness test by taking a cylindrical rock core one inch in diameter and subject it to the abrasive of quartz sand fed upon a revolving steel disk. Hardness equals 20 minus 1.3 W, where W equals the loss in weight after one thousand revolutions of the disk.

The toughness test is determined by subjecting a cylindrical test specimen one inch by one inch to the impact produced by the falling of a 4.4 pound hammer upon a steel plunger, increasing the height of the fall of the hammer one centimeter (0.39) inch) after each blow

The French devised a test for measuring the combined action of abrasion and impact by taking 11 pounds of freshly broken rock between 2 and 2 1/2 inches in size, placing it in a special cylinder so mounted that the axis of rotation is included at an angle of 30 degrees, results in throwing the rock pieces from end to end and against each other twice during each revolution. After 10,000 revolutions the resulting material is screened through a 1.16 inch stove and the weight of the material passing the screen divided into 40 gives the French coefficient of wear.

The cementing, value or binding power is determined by taking 1.1 pounds of material and grinding it down to the consistency of a stiff dough which is moulded into cylindrical briquettes 1 inch by 1 inch and after it is thoroughly dried is tested to destruction by a 2.2 pound hammer falling through a constant height of 1 centimeter. The number of blows producing failure, is called the binding power.

Binding power is of importance only in connection with macadam road construction. Good practice on macadam roads calls for higher general limits than most any other class of road; they are as follows:

French coefficient of wear, for light traffic, 5 to 8; for heavy traffic over 15. Toughness, for light traffic, 5 to 9; for heavy traffic, over 18. Hardness, for light traffic, 10 to 17; for heavy traffic, over 17. Binding power above 25.

The present unsatisfactory condition of most of our macadam roads is due in very large measure to the failure to properly maintain them. The French have thoroughly demonstrated the fact that limestone macadam roads are economically possible where an abundance of limestone is near at hand. We can do the same in Arkansas with gravel on all of the secondary roads, where good travel abounds near at hand; but extreme care must be taken to figure first

cost and maintenance against the same items for high class construction, because the maintenance on the macadam and gravel roads mounts to a considerable figure each year.

The limiting values required for the best types of bituminous construction, are as follows:

French coefficient of wear, light traffic, 5 to 7; for heavy traffic, 7 to 10. Toughness, for light traffic, 5 to 7; or heavy traffic, 10 to 15.

For concrete they are as follows:

A minimum hardness of 12 for moderate traffic and of 16 for heavy traffic, and a minimum toughness of eight for both classes of traffic.

These simple tests will be made by the United States Department of Agriculture upon application, free of charge, at any time, by sending sample. And the Pittsburg Testing Laboratory now has a branch here in Little Rock, where all kinds of tests can be obtained at nominal cost.

Little Rock and vicinity produces by far a larger quantity of rock suitable for good road work than any other point in the State. The quarry at Big Rock, which has been in operation 12 or more years, has shipped out not less than five million tons of what is locally known as trap rock, but technically it is Feldspathic sandstone. Very recent tests show the following qualities:

French coefficient of wear, 24.1; hardness, 19.5; toughness, 24.5; binding power, 138.

Complete tests have been made on the Fourche mountain granite with the following results:

French coefficient of wear, 10.8 to 13.8; hardness, 18.0 to 18.7; toughness, 12.0 to 16.0; binding power, 18.5 to 42.8; mortal tensile strength, with fine crushed stone alone, no sand, 210 to 215; heated to 600 degrees F., then held in stream of cold water without effect.

A sample of sand-stone from Pinnacle mountain gave the following results:

French coefficient of wear, 6.3; hardness, 16.3; toughness, 10.

Quarries are being operated at several other locations in this vicinity, notably: Blue Trap quarry near the Country Club, no tests available, but this is material that will test above the requirements.

A sand-stone from Faulkner county gave the following results:

French coefficient of wear, 15.4; hardness, 17.3; toughness, 25.

A quartzite from Sevier county gave the following: French coefficient of wear, 17.4; hardness, 19; toughness, 32.

A sand-stone from Johnson county gave the following:

Hardness, 18.7; toughness, 13.

With gravel, the binding power is the prime requisite. The following tests are available:

From Benton in Saline county, binding power 67.

From Forrest City, St. Francis county, binding power 44.

From Cross county, binding power 86.

From Howard county, binding power 95.

From Carroll county, binding power 55.

The above combined with the tests made several years ago and published in Bulletin No. 370, show that road building materials testing above the requirements for the highest types of present day construction, can be had in almost all parts of the State.

Kansas Owes Big Debt to Earth Roads Machinery

Kansas' gravel and macadam roads have all been built of local material, and the counties are making extensive use of motor trucks and trailers for hauling metal for the maintenance of these roads, recently wrote W. S. Gearhart, state highway engineer.

The macadam is loaded from bins and the gravel with loaders. The material is spread by the trucks as it is dumped and afterward shaped with a grader and a spike-toothed harrow. By thoroughly harrowing the loose metal all of the cores are removed and the particles key together and take their natural position in the road surface. Harrowing saves at least one-third of the rolling otherwise required.

For blade-grader work on the earth roads the power is almost exclusively gas or steam engines or motor trucks. There are in the state between 6,000 and 7,000 privately owned large traction engines, and until the threshing season opens in July much of this equipment is available for road work. Engine power is at least 50 per cent more efficient than teams, and on the smooth prairie or rolling country no difficulty is experienced in operating such equipment. Ordinarily, the graders are pulled by one engine, and the graders are attached with an offset hitch so as to place the grader next to the engine out in the ditch and the second one just behind it. This keeps the engine on the solid ground and where it will roll and compact the loose earth as it is pushed into the ground.

For cleaning the side ditches and smoothing the shoulders the road planer is used exclusively. It is necessary to hitch a heavy drag behind the planer to spread the loose earth, which is shoved up into the middle of the road, and level it down to an oval cross-section; otherwise the planer leaves the road shaped like a house roof.

Some 15 counties have purchased 5-ton motor trucks to haul road and bridge-building materials and to pull their blade graders and planers. The large trucks are proving very satisfactory where they are used extensively for hauling materials, and the pulling of graders and planers is merely incidental or a minor part of the use made of them. When the majority use to be made of a truck is the pulling of these machines, it is not very economical, for just as good if not better power in other forms can be had at less cost.

In general, it is found not economical now for the county to own the power if good power can be hired for about \$32 a day, or \$4 per hour. (Doubtless since this was written prices have advanced.—Editor.)

Earth road drag men are given from one to five-mile sections of road to maintain and they are required to drag the road whenever it needs it, and to do all the necessary ditch cleaning, repairing of bridges and culverts, and other incidental work. Since the drag men live along the road they maintain, they take great pride in keeping their sections in good condition and they can do this work more economically than anybody else.

These drag men are generally strong believers in local control of road matters, and this gives them more supervision of the road they use most than they ever have had before and really all the work they can afford to put on the road. Under these conditions they take very kindly to suggestions and advice from the county engineer, who has direct charge of the work.

Kansas' highway commission is urging that all earth roads be maintained to the highest state of perfection.—Roadmaker, Excavator and Grader.

Arkansas' Mammoth Road Program

By W. B. OWEN

Commissioner of State Lands, Highways and Improvements, Little Rock, Ark.

ARKANSAS! The name carries a new meaning in these days of progress and development. In the olden days, it must be admitted, the name was seldom mentioned by the uninformed save in derision, associated only with "The Arkansaw Traveler" and "The Slow Train Through Arkansas"; a State supposed to be easy-going, slow, careless and non-progressive, without ambition or natural resources; a State whose people were popularly supposed to live only in the present, forgetful of the past and careless of the future, whose whole conception of life consisted of "red licker," "coon skins" and "fiddles."

In the earlier days such yarns were told of Arkansas and readily believed by many because the people of the State, being independent and caring but little what the world might think of them, failed to deny the charges. Hence these fictions became fact to those who knew no better, and who had no disposition to learn the truth. Then came a new day. The people of Arkansas became conscious of their own powers and resources and developed a State pride which has, within recent years, effectually set at rest the slanders spoken and written against the State. The log cabin has disappeared and industry along the most constructive modern lines is taking possession of every corner of Arkansas and foreign capital is kindling the State with its rejuvenating energy.

In no particular has this new State policy been more thoroughly demonstrated than in the good roads program. For years that consisted only in agitation, education, State conventions and resolutions, but now it is being realized in a definite way.

It is the same people, whom the uninformed have misunderstood and slandered, who have authorized, by general law and special act of the Legislature, the issuance of \$100,000 bonds for highway improvement; who are planning to construct 8,500 miles of improved highway, forming a system connecting all-important points and all county-seats, as well as making connection with all trans-State national highways; who have a vision of the future years and possibilities, which causes them to unite in a systematic program for the construction of roads that will provide an adequate motor truck transportation for the development of the interior, and at the same time take care of all railroad congestion.

Of the 8,500 miles of road, 3,600 miles connect the county-seats and important urban centers and 4,900 miles are laterals which serve as the connecting links providing transportation to interior sections not served by the railways. In laying out this program, through roads with interstate connections were given the greatest consideration, and the whole program is so planned as to be adequate for future years for generations to come.

In carrying out this program there is being issued more than \$100,000,000 in bonds, nearly all of which have been sold or bargained for and the money delivered on most of them.

This good-roads program is the most stupendous undertaking that has ever engaged the attention of

Arkansas citizens. As compared with the work done upon our roads only a few years ago, the volume of work is amazing, and it appears to be only at the beginning. As stated before, there is now approximately a total of 8,500 miles of improved highway under construction or in immediate prospect. On April 1, at the conclusion of the regular session of the Legislature, there was a total of 7,055 miles in going projects, of which 5,250 miles had been created by special act, the remainder being under provisions of the Alexander law for 400 miles more. The extra session of September provided for 1,350 miles, but this was all nullified by the action of the Supreme Court, which the January extra session has been called to remedy. There is now under construction, or provided for by contracts let, about 3,000 miles, of which one-third, approximately, is under the Alexander law; 600 miles is of high-type asphalt surface construction.

The greater part of this improvement is paid for by the abutting property, but a very substantial aid is given by the State from the proceeds of its automobile license fund, and by the Federal Government through the Shackleford appropriation. The amount available from State and Federal sources for the five-year period ending April 1, 1921, is approximately \$6,000,000. This allotment was made April 1, 1919, of amounts available and in prospect, and was based upon the known mileage at the time, not taking into consideration the possibility of a largely increased mileage by an extra session, and consequently the creation of nearly 2,000 more miles of road means a very small amount of aid possible to be rendered unless Congress should enact some of the pending laws providing additional appropriations. The amount provided by Government aid is relatively small when it is considered that the roads provided for will cost approximately \$100,000,000.

An erroneous impression prevails in some quarters that the State and Federal governments will contribute 50 per cent of the cost of the roads. This would be true if sufficient money were available for the purpose, which it is obvious is not possible under present conditions. The Federal law provides that the amount of aid on any given road cannot exceed 50 per cent of the cost, but, as a matter of fact, the mileage so greatly exceeds the available funds that it is not practicable to stretch the limited cloth to cover the entire area. The State aid is about one-third the Federal aid. The first appropriation by the State from the proceeds of the automobile license fund was \$496,000 for the biennial period 1917-18, and the Legislature of 1919 made an appropriation of \$950,000 for the ensuing biennial period. The amounts now available under the Federal act are as follows: 1917, \$82,689; 1918, \$165,378; 1919, \$2,350,247; 1920, \$336,091, and for 1921, \$1,685,178, the latter amount not being available until after July 21, 1920, making a total of \$4,619,929.

There are 187 projects in the State, of which 81 have been approved for Federal aid. These projects cover all counties except Marion, Madison, Izard, Cleburne, Clay, Calhoun, none of which have received aid; also Saline, Pike, Hot Springs, Fulton,

Drew and Ashley, none of which have been aided as counties, but which have received aid on inter-county projects. The only reason these counties have not been aided is that they have not perfected their projects and made application for aid.

These are facts that must be taken into consideration in the creation of new projects. There is now pending a bill making \$100,000,000 immediately available for road construction and an equal amount annually for the next three years. This measure was recently endorsed by the convention of State Highway Officials at Louisville, and should it be passed will increase materially the fund available for use in our State. The prospects for its passage are good, but should not be too implicitly relied upon.

There is no one in the State more thoroughly committed to the good roads program than I, and yet I am convinced that we should use common sense and be more deliberate in the creation of additional projects until greater progress has been made in completing projects already inaugurated. Not only the heavy tax burden justifies the admonition, but the excessive cost of labor and material entering into road construction and the comparative shortage of contractors and labor seem to me to make caution imperative.

There are 11 inter-county projects, to which aid has been rendered as follows:

Arkansas and Louisiana Highway, in Ashley, Drew, Chicot, Desha, Lincoln counties, 153.62 miles, \$300,000 allotted.

North Arkansas Highway District No. 2 in Fulton, Izard and Independence counties, 69.25 miles, \$144,649.30 allotted.

Little Rock and Hot Springs Highway District, in Pulaski, Saline and Garland counties, 62 miles, \$87,500 allotted.

Woodruff and Prairie County District, in Woodruff and Prairie counties, 20 miles, \$12,500 allotted.

Howard and Sevier Improvement District, in Howard and Sevier counties, 15 miles, \$24,000 allotted.

Southwest Arkansas Road Improvement District No. 1, in Garland, Hot Springs, Clark, Montgomery and Pike counties, 60.55 miles, \$8,855.59 allotted.

Lincoln and Desha District, in Lincoln and Desha counties, 9.2 miles, \$7,700 allotted.

Madison and Carroll District, in Madison and Carroll counties, 70.29 miles, \$40,000 allotted.

Prescott-Blevins District, in Hempstead and Nevada counties, 14.5 miles, \$8,680 allotted.

Searcy and Van Buren District, in Pope and Newton counties, 26.23 miles, \$40,000 allotted.

Pulaski-Perry District, in Pulaski and Perry counties, 42 miles, \$21,250 allotted.

Big Road Exhibits to Be at Hot Springs

In recognition of the importance of the eighth annual convention of the United States Good Roads association, as well as the United States Good Roads Show, that will take place in Hot Springs, Arkansas, April 12 to 17, 1920, the Bureau of Public Roads, which is under the Department of Agriculture at Washington, has written Mr. J. A. Rountree, Director General of the United States Good Roads Association, that it will be pleased to send a comprehensive exhibit to Hot Springs and requested him to set aside two thousand square feet of space for this Government Exhibit. They will send representatives from the Road Department at Washington to have charge of the exhibit and to explain the same to the visitors.

This exhibit will be educational, will be worth riding thousands of miles to see, and will be one of the great attractions at Hot Springs.

Not only the Agricultural Department will have an exhibit, but the War Department will also have a comprehensive exhibit.

Director General Rountree has written to the chief of the Office of Exhibits assuring him that the requests the Government has made of the United States Good Roads association and the citizens of Hot Springs will be fully carried out and that deep appreciation is extended for this exhibit. Besides the Government exhibit, twenty-five thousand feet of floor space will be used for an exhibit of street and road machinery and material.

Contract for Muskogee county road construction to cost \$390,500 was awarded recently to the Froebe-Briscoe Construction Co. of Muskogee, Oklahoma. This contract calls for the construction of 30 miles of gravel highway.

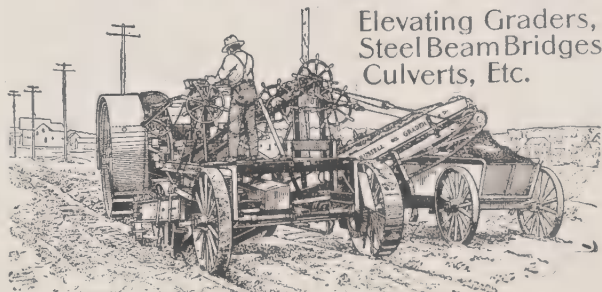
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Will Surface-Treat 75 Miles of Road This Year

By FRANK E. KURZENKNABE

County Road Engineer of Fayette County, Kentucky

Fayette county has 340 miles of waterbound macadam roads which, if they were to be reconstructed today, would cost \$3,400,000. Therefore something must be done to preserve these roads from the scouring effect of the motor vehicle. They are a wonderful asset to us, and we cannot construct all these roads with high-type materials. At present prices of brick, asphalt and concrete, it is folly to even build any of these high-type roads.

There is going to be so much road work let in the year 1920 that there will be a great dearth of building material. So, in my judgment, the wise plan for us to follow is to select a system of road maintenance which requires the least material—namely a system of repairing and maintaining our excellent macadam roads.

Our present efforts of maintenance with rock and screenings thrown in the holes is entirely inadequate and very costly.

Under this system our roads are wearing out faster than they are being constructed.

The rock is wasted because the automobiles suck it out of the holes and scatter it over the road where it is ground up and blown away as dust. Some of this rock is costing as much as \$3 per ton on the road, and we can ill afford to have the rock wasted.

No road fund would be large enough to allow this sort of maintenance to catch up with the present traffic conditions on our highways.

I have worked out a scheme of operation for the resurfacing of our roads which I feel sure will meet with all our present conditions, and which will give us the greatest value for our investment, allowing us to distribute our road fund more uniformly over the entire county.

This method of road maintenance and repair is to mix our rock with some kind of bituminous material, such as asphalt or tar, which is to be used to patch the holes, and surface treat the roads with a heavy asphaltic oil, covering the road with pea gravel or stone chips. This is called surface treating and is being used extensively throughout the United States to preserve existing macadam roads against water and motor vehicles.

I have made a very careful study of the road problems of this county for the past two years, and it is my opinion that we should not discard our 340 miles of excellent macadam highways so long as we can preserve our original investment with sand and oil.

We now have 49 miles of high-type road, including asphalt and concrete, both natural and oil, tar, rock, asphalt and concrete, and I believe that we should now bend our efforts toward the preservation of our existing macadam roads which are wearing out faster than they are being repaired, on account of the increased traffic conditions, and the lack of a comprehensive and adequate maintenance scheme.

The Fiscal Court of Fayette county, after a careful study of the roads, adopted the foregoing recommendation, and as a result this policy will be carried out in the county during 1920.

Progress of Highway Construction in Georgia

Good roads in Georgia are good in fine weather but what are they in bad weather? That is the test of a good road. A highway should be built in such a

manner that it can be traveled on in the worst weather as safely and rapidly as in good weather. That such is not the condition of Georgia roads is attested by the traveling man who sent a little note to The Herald Saturday. He said that roads in a certain section were "rotten" and he is right.

The good road movement in Georgia has accomplished more in the last five years than ever before but the near future will demonstrate what can be done and what should be done to make the roads of Georgia

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gia really useful highways. Here are some facts about the roads of this state as presented by R. P. Brooks, an official of the Fourth National Bank of Macon:

A dozen years ago there were scarcely any good roads in Georgia except in the counties containing large cities. There was no State control over highway construction or upkeep, each county being left to work out its own salvation in this respect. From time to time the legislature had adopted a number of road laws, under any one of which the counties might operate. In some counties there was a compulsory levy of labor, able-bodied men, with certain classes excepted being required to work a given number of days each year on the public roads. In other counties commutation was the rule—instead of doing the work personally, those subject to the requirements were allowed to pay a small tax. The fund thus obtained was used under county authorities for road work. Still other counties under an act of 1897 worked the short-term convicts on the roads.

The first great impetus to good roads in Georgia came in 1908 when the State put an end to the vicious practice of leasing convicts. The act of 1908 required that all able-bodied male convicts, whether misdemeanor or felony, be used on the roads, and prescribed minute regulations for State control. The abolition of the leasing system was due to humanitarian motives, but it had highly important economic results. With a dependable supply of labor working under close control, a striking improvement began to appear in the roads. Many new highways were laid out, old roads were widened, hills were graded down, and bridges were built, the 'sand-clay' type of road

came into general use.

Up to the present time (October 15) forty-four counties have voted bonds for road purposes.

The legislature of 1919 did a great deal of constructive work. Probably no single set of measures is of greater moment than those dealing with the road question. The Commission of 1916 was reorganized, a new board to consist of three members, appointed by the governor for terms of six years, being substituted, a member to come from each one of three main sections of the state. It was directed to employ a State highway engineer. Professor Charles M. Strahan, head of the department of engineering of the University, has been chosen for this position. The act created a "State-aid road fund" to be controlled by the State Highway Commission. The object of this provision is to build, by State aid, a series of connected highways in every Georgia county. Two roads are to radiate from each county seat to the county line and connect there with similar roads in the adjacent counties. The act provides that when any road of the county has been chosen as part of the State-aid system, the county shall be relieved of all charges for the building and maintenance of it. The total mileage of the State-aid roads is limited by the act to 4,800. —Athens (Georgia) Herald.

The Campbell Construction Company, of Columbus, Georgia, have been awarded a paving contract amounting to 70,000 square yards for the paving of amounting to 70,000 square yards for the paving of city streets with vitrified brick, work to commence immediately.

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Farmers Favor Good Hard Roads

Good roads are the greatest economic needs for agricultural communities. This is the answer of 200 prominent farmers of the State of Maine to questionnaires which asked them to summarize urgent necessities to bring their district up to the desired economic standard. The farmers who answered the questionnaires were selected as those best fitted to answer the questions, and they were asked to furnish a digest of the situation in their respective communities with reference to the acreage, crops, farm improvements, civic and social conditions, and so on. The definitions of the greatest needs covered a wide and interesting range. The largest record of needs was good roads, 85 emphasizing the urgent necessity of adequate highways. There were 45 who asked for more farm laborers, 44 for cooperative buying and selling, 35 for better school privileges, 29 for more blue-blooded stock, 29 for more manufacturing plants, 29 for better marketing facilities, and 21 for greater credit extensions by banks.—Hiawatha, Kansas, World.

Delaware Engineers Organize

On November 20-22, the state highway department of Delaware held its first annual good roads exhibit in the lobby of the Hotel DuPont, at Wilmington, Delaware.

This exhibit, which included maps, plans, photographs, models, and equipment arranged to show the department's work and progress, attracted much attention and favorable comment. On Saturday, No-

vember 22, an all-day meeting of the state, county and municipal engineers of Delaware was held and papers on road problems were read and discussed. Much enthusiasm was shown and a permanent organization was formed with the following officers:

President, Charles M. Upham, chief engineer, State highway department; vice president, Charles E. Grubb, highway commission; secretary, Warren W. Mack, assistant engineer, State highway department, and treasurer, Harry Maier, street and sewer department, Wilmington.

The American Association of Engineers was also presented, many applications being received and plans discussed for a local chapter.

A banquet to the department's engineers by Governor Townsend in the evening was also much enjoyed.

The contract for the construction of the Os steel bridge on the Little Rock and Hot Springs Highway has been awarded to the Illinois Steel Bridge company of Jacksonville, Illinois. The bridge will cost \$97,675.

News comes from Waycross Georgia, that a contract for 18,000 square yards of street paving has been let to the Pittman Construction Company, Atlanta, Georgia, to be built with paving brick to the amount of approximately \$100,000. Paving brick will be furnished by the Southern Clay Manufacturing Company, Chattanooga, Tennessee.

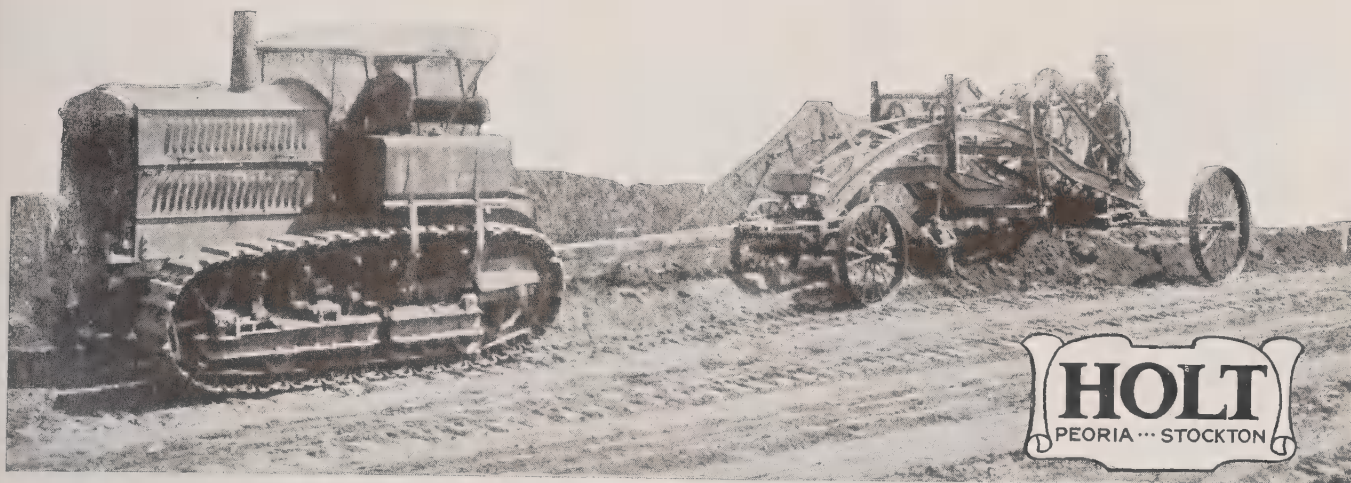


An 18" Diameter "GENUINE OPEN HEARTH IRON" Culvert Pipe in Use on the Weldon-Jackson Highway in Northampton County, N. C. Photograph Taken Feb. 17, 1916

THE photograph above gives an excellent idea of the resistance of "GENUINE OPEN HEARTH IRON" Culverts to extraordinary wear. It is not often that a Culvert of any type has to withstand the direct wear and tear of the heavy traffic coming in contact with the bare surface, but such is the case in this instance. This Culvert has been in use since the Fall of 1910, and as the picture was taken February 17, 1916, you can readily understand that it must have had rather hard knocks in that length of time. Our Mr. J. H. Slaughter took this photograph with a kodak and states that not only was this Culvert exposed in the manner shown, but at least a dozen more on the same road were installed under like conditions and have been subjected to the same rough treatment for the past few years.

We not only claim superiority for the material of which our Culverts are made, but also superiority of workmanship and therefore of the lasting qualities of our Pipe. We manufacture only one grade of "GENUINE OPEN HEARTH IRON" Pipe and have no seconds to offer in this material. Being a high grade material, it costs us more money than the ordinary grade of Galvanized Steel, and quite naturally we have to secure a better price for it. Therefore, beware of cheap Culvert Pipe.

The Newport Culvert Company, Inc., Newport, Ky.



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"It's a wonder for road work."

Quoted from a long list of complimentary things said by a prominent contractor

Who KNOWS.

It builds roads but needs no roads.

Builds 'em from start to finish.

Overcomes obstructions that put ordinary tractors and trucks out of commission.

Climbs what might be called "impossible" grades. Pulls what might be called "impossible" loads.

Crosses ditches as if they weren't there.

Rips stumps from age-old moorings.

Pulls all road machinery from plows to trailers—EASILY.

Because it has TRACTION—plus.

Every pound of motor power and draw-bar pull goes into useful work.

When mules and horses, trucks and trailers flounder and stall, those who know exclaim, "Get a 'Caterpillar.'"

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Every one of them was based on the "Caterpillar" principle!

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Operated by one man.

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Nor ties.

Nor right-of-way.

Weights but ten tons.

Comes in a package 146 inches long 80 inches wide and 81 inches high.

Lays 30 miles of steel track in a working day.

Rolls it up again and leaves the ground free from scar or blewish.

THAT is the "Caterpillar."

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THIS ROAD WITHSTOOD TWO YEARS OF ARTILLERY CAMP TRAFFIC

This is the road from Louisville to Camp Henry Knox—Uncle Sam's big artillery encampment. Photo taken November, 1919. It was constructed in 1915 and 1916 of **Kentucky Rock Asphalt** on an ordinary macadam base. During the war it was subjected to a most gruelling test—a test unfair to any road.

Four thousand vehicles pounded over its surface every day for almost two years. There were army

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Theoretically, this road long ago ceased to exist. Army traffic has ground to pieces the best highways.

Actually, the road is still there and in excellent condition—not a hole, not a crack, in its surface.

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Kentucky Rock Asphalt was mixed by Nature in a process requiring thousands of years.

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Kentucky Rock Asphalt is laid cold on an ordinary limestone, hard sandstone, slag, granite or concrete base.

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Kentucky Rock Asphalt has made possible and practicable the surfacing of country highways with asphalt where heretofore the cost of laying and maintenance has been almost prohibitive.

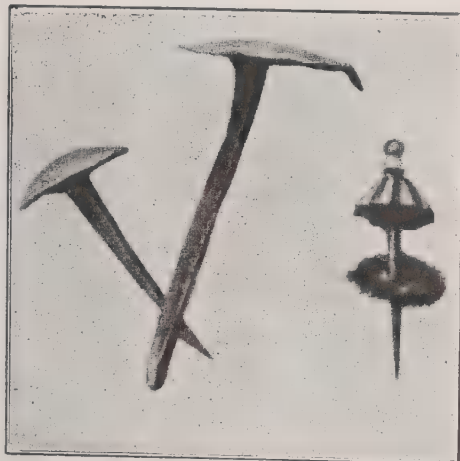
EVERY State, County and City official, and any other individual interested in Good Roads, should have our booklet, "THE ROAD TO CAMP KNOX." It is a most interesting story of this natural paving material. Write for it today.

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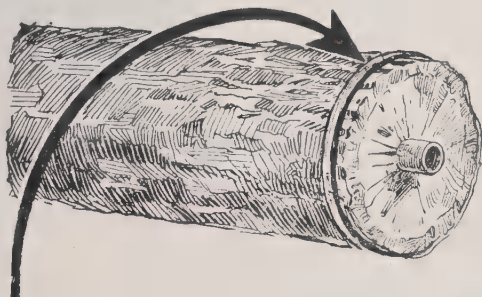
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Ancient Moorish nails of pure iron from a doorway in Spain. Although undoubtedly made before the discovery of America (1492), these nails are in almost perfect condition after more than **FOUR CENTURIES** of service. Analysis shows extremely low contents of carbon, manganese, copper and sulphur.



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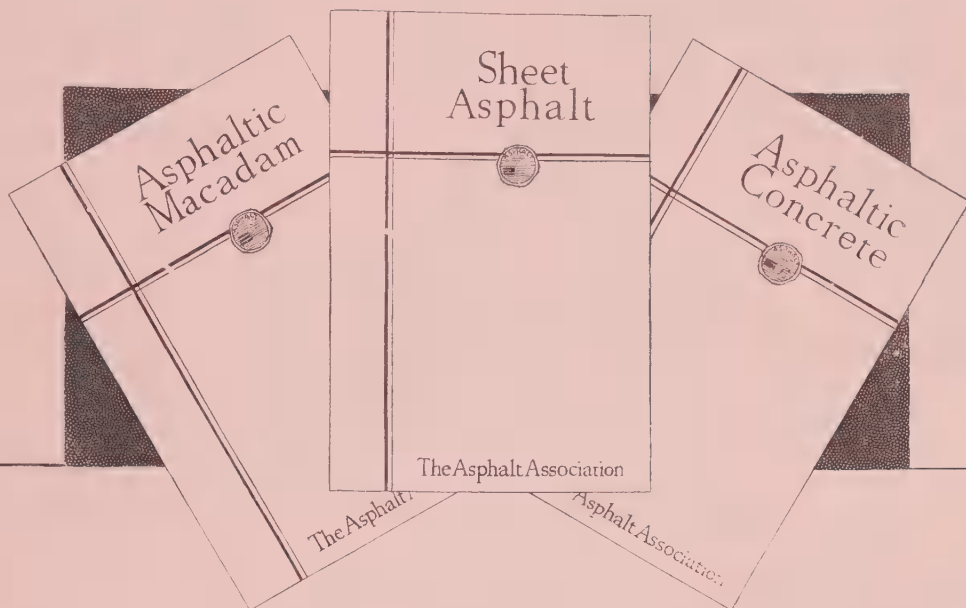
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valuable instructions and standards of practice for engineers for various types of construction and maintenance involving the use of asphalt.

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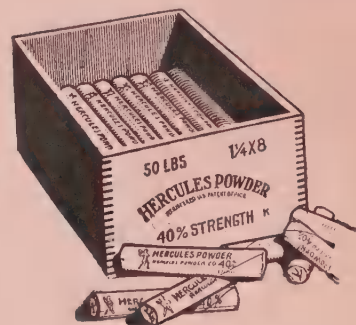
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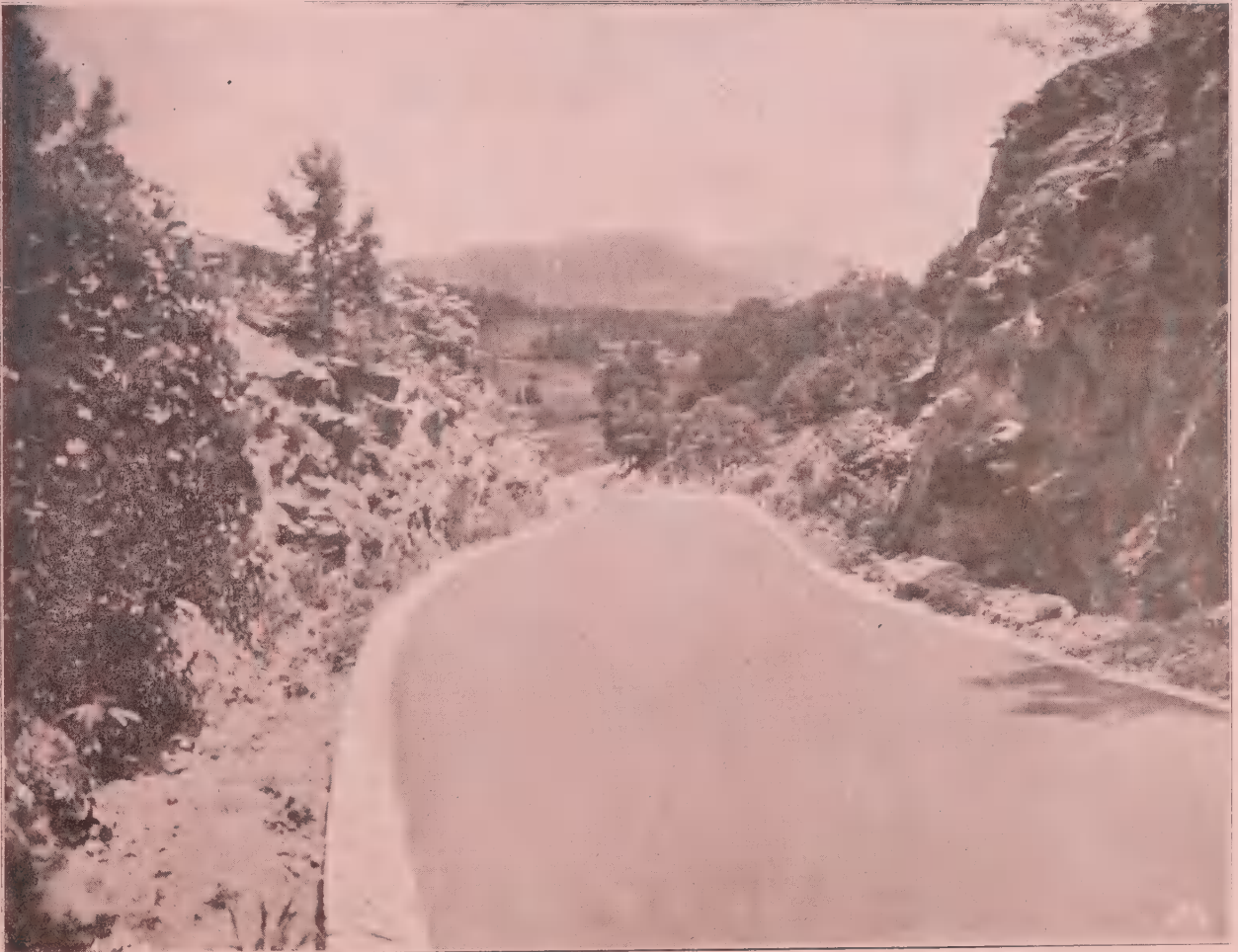
SOUTHERN GOOD ROADS

HIGHWAYS - STREETS - MOTORING

Vol. XXI - 3

Lexington, N. C., March, 1920

10c. a copy



Charlotte-Asheville-Wilmington Highway at Gashes Creek—Sheet Asphalt Laid Over Old Macadam

PUBLISHED BY

SOUTHERN GOOD ROADS PUBLISHING COMPANY
LEXINGTON — NORTH CAROLINA



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SOUTHERN GOOD ROADS

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Lexington, N. C., March 1920

Entered at Lexington Post Offices
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American Highways for Tomorrow

By H. G. SHIRLEY

Secretary Federal Highway Council

IF IT WERE WITHIN the power of man to look into tomorrow, what a chaos it would make of the affairs of our country! There would be sorrow for some, joy for others, poverty, riches and even death would seal the final chapter of many. But when man was created he was endowed with the power of thought, rather than with the power of vision into the future, and this faculty with the body has enabled him to provide for his own and his fellow man's wants on earth, as we believe the Soul, the great unseen and unknown, guides and preserves his being in the world to come.

So, in taking up this subject of "American Highways for Tomorrow," it must be remembered that it is purely the work of the mind, and for the sake of distinction, I have separated it into two heads; the Imaginative and the Speculative, and a further separation into National, State and County Highways, each divided into three classes, A, B, and C.

The Imaginative Road is a dream of what the roads of our country will be ten or twenty years from today.

The Speculative Road is what we estimate they will be, basing our assumption on past experience and what has been accomplished as a basis of calculation.

All things constructed have their original in the mind. The architect sees the complete building before he starts to put his plans on paper to be carried out by others, for if he did not imagine and clearly picture in his mind what the completed structure would look like he would be unable to perfect the plans and to show the many details and parts that go to make up the structure.

The City Planner in planning for a new city or the enlargement of an existing city, pictures in his mind what the City will look like when it has been completed.

How well the trained mind can picture such development is illustrated by the planning and laying out of the city of Washington and many other modern cities. The same holds good in every other line of planning and construction and in considering The Highways For Tomorrow, we must not let our minds have small limitations, for the picture as I see it, is one of magnitude, beauty and great material and recreational value to all the people.

The Highways For Tomorrow will be divided into

three distinct groups—National Highways, State Highways, and County Highways. The National Highways will be built and maintained by the Federal Government, the State Highways by the State, and the County Highway by the County; furthermore, each group will be composed of three classes, such as Class A, B and C.

Class A, National Highway, will be the main trunk highway passing through a State connecting up the main centers of population, and serving the most densely populated sections where the greatest volume of traffic will be found. The volume of traffic on a Class A road will not be less than 3,500 tons per day not including weight of vehicles.

The width of the right of way will not be less than 100 feet and the surfacing not less than 60 feet.

The surfacing will be of the most durable materials, and designed to carry a load of 20 tons; twelve tons being concentrated on the rear axle of the vehicle.

All grade crossings of railways or trolley lines will be separated by overhead or undergrade crossings, and intersecting roads will have a clear vision at all intersections of fifty feet or more.

Large expenditures will be made to straighten alignments and in the reduction of grades.

The surface will be smooth giving the least amount of tractive resistance and vibration.

Curbs, gutters, inlets, catch-basins, and a complete sub-surface storm water drainage system will be provided. A sufficient width on either side of the road bed will be set aside for the planting of trees, the laying of sidewalks, conduits, pipelines and other surface or sub-surface structures, and buildings for public use, such as rest sheds and comfort stations.

All curves will have a vision of at least 400 feet ahead, and the road bed and surface around all curves will be elevated from the inner edge to the outer edge, the amount of elevation being computed for the degree of curvature and a speed of at least 35 miles per hour.

Great care will be taken in laying out and establishing a Class A road, points of interest and historical value will be marked with suitable tablets, or monuments, or other devices; the proper arrangement of trees and shrubbery so as to make the layout most attractive. Comfort stations will be placed at convenient intervals. Care will be taken to have the slopes

of the banks planted in grass and other suitable foliage.

Direction signs of neat and attractive design will be erected at all intersecting roads, giving the direction and mileage to the nearest town or village, and to the nearest important city or large town in that section. The sign will show this information from both directions and in the direction of each intersecting road.

Signs giving the name of the city, town or village will be erected where the National Road enters and leaves.

CLASS B NATIONAL HIGHWAY.

The Class B National Highway will consist of those roads having a density of traffic of over two thousand tons and under 3500 tons per day. They will have a right of way of at least 80 feet in width and a surfacing of 40 feet wide.

All drainage will be provided and where necessary a sub-surface and storm water drainage system will be installed. The surface will be designed to carry a moving load of twenty tons, twelve tons of which will be carried on the rear axle with a wheel load of six tons.

The materials for the construction will be similar to those used in the Class A highways.

The treatment of the portion outside of the paved surface and shoulders will be of a rural character. Trees being planted which will be both productive and ornamental.

This Class of highway will serve sections of the country where the land is practically all under cultivation and small towns and villages are not remote distances apart, or where industries are established requiring considerable tonnage to be transported over the highway.

CLASS C NATIONAL HIGHWAY.

The Class C National Highway is a class of roads that will be used where the traffic does not exceed two thousand tons per day. It will have a right of way of not less than 60 feet in width and a surfacing of 20 feet in width designed for the same loading in class A and B.

This Class of road will run through sparsely settled sections of the country tying into Class B highways. It will traverse hill and vale, prairies and mountain, swamp and table-land, and be the artery that will tie remote and densely populated sections of our country together. It will join all parts of the country making easy and convenient communication among all its people, inducing social intercourse and thereby making us all one of a great family, in whose joys we may rejoice, and whose sorrow we can share. Without personal contact, both with persons and things, the East will never understand the problems of the West, nor the North those of the South and vice-versa.

The treatment of the right of way of this Class of highways will be to disturb its natural beauty as little as possible but all means will be taken to assist and bring it out with greater prominence. All historical points will be marked with attractive monuments and tablets. At points where there is beautiful scenery there will be parking spaces provided and observation and shelter sheds erected. Vistas through the trees of the forest will be cut at points of vantage, and where beautiful scenery will be opened up. Shelter sheds and lodging shelters will be erected at convenient intervals, and telephones installed therein, when there are telephone lines on the highway. Plots of great natural beauty will be set aside and preserved. Small dams will be erected at points where an ugly gully and

stream can be changed into a beautiful lake, stocked with fish and the expense will be justifiable.

SNOW FENCES. Snow fences or brakes will be constructed on all highways at all points where the snow drifts, relieving as much as possible the necessity of removing large quantities of snow. With such places protected, snow plows and shovels, operated by tractors and trucks will keep the roadway free of snow and open to traffic at all times. Where there are heavy falls of snow, the Maintenance Department will be fully equipped with all necessary equipment, and organization to quickly remove the snow after each snow fall. The width of road that will be cleared of snow will depend on the volume of traffic passing over the highway, but under all conditions at least 16 feet will be cleared.

GUARD RAILS. On Class A National Highways where curbs and gutters have been constructed, no guard rail will be required except on the outer edge of the sidewalk along embankments to protect pedestrians, and it will be constructed of shrubbery or hedges. On Class B National Highways, at points where necessary, guard rail of neat design and permanent nature will be erected. Guard rail for Class C National Highways will depend on the availability and cost of materials. It will consist of all kinds of materials from concrete walls to large boulders or rustic fences.

DANGER SIGNS. Danger signs of standard design will be erected on all highways at approaches to all sharp curves, sudden brakes in the grade where the view is obstructed and at other points where there are elements of danger. Only standard signs will be used so that the traveling public will become familiar with them and know for what they stand. The sign will be equipped with a lighting device to properly illuminate it at night. The great variety of danger signs now used and the number of false ones used for advertisement purposes make it impossible to know when you are approaching a danger point on the highway and will be prohibited.

MILE POSTS. Mile posts on Class A National Highways should be neat in design and permanent in nature and erected just behind the curb and back of the hub line. The mileage will be given to the nearest town and to the largest city in that section in both directions. Class B and C National Highways will have mile stones similar in design to Class A, with like information thereon.

BRIDGES. The term "Highway" as commonly used, includes all bridges and culverts and as there is no chain stronger than its weakest link, the bridges will be erected of sufficient strength to carry any load that the surface of the highway can safely withstand. All bridges on Class A National Highway will be at least 50 feet between the curb lines with a suitable space for sidewalks. All bridge floors will be of the solid type and designed along with the other portions of the structure to carry a 24 ton truck on four wheels, distance between axles 10 feet and a concentrated wheel load of 5 tons. Close study will be made of each location and a design selected that will fit in with the general landscape and be most pleasing to the eye. Great care will be taken with all railings both in design and construction so that they will have proper proportions, not too wide or too broad so as to look heavy or so light as to look flimsy. On concrete bridges care will be taken that the railing and coping will be constructed absolutely true to line. On each bridge there will be

attached a tablet giving the name of the bridge, the name of the stream its spans, and a brief historical sketch of the bridges heretofore erected at this point. Where large and important bridges will be erected architectural features will be given close study and consideration, and the bridges of tomorrow will be a thing of beauty as well as utility. Bridges erected on Class B National Highways will be designed for the same loading as Class A but will have a width of roadway of 40 feet. All other features will be studied and made in direct proportion. Bridges on Class C, National Highways will be designed for the same loading as Class A and B, but will only have a clear width of roadway of 30 feet. It will not be the only function of a bridge to carry traffic over a stream or difficult place, but its design must be such that it will fit in with the landscape so as to add beauty and stateliness to the highway. Many old and handsome stone arches erected 100 years ago on the Old National Road have been, and are today a joy and delight to travelers who have been so fortunate to view them.

CLASS A STATE HIGHWAY.

Class A State Highway will be the main arteries in the state connecting up with the National Highway System or large towns and cities not connected by the National System. They will carry traffic similar to Class A and B National Highways and will have a right-of-way of 60 feet in width with a surfacing of 24 to 30 feet. The surfacing will be designed for a 20 ton vehicle, having 12 tons concentrated on the rear axle with a wheel load of 6 tons.

The treatment of right-of-way outside of the shoulders and gutters will be variable and according to the development of the country through which they pass. Spaces for telephone lines, conduits, water mains and other sub-surface structures will be provided outside of

the surfaced area and a parking space set aside for trees. The general type of treatment of right-of-way will be similar to that for Class B, National Highway.

CLASS B STATE HIGHWAY.

Class B, State Highway will have a right-of-way of not less than 40 feet in width and will be surfaced for a width of 18 to 24 feet. Careful study will be made of the traffic and the possible future traffic over this class, so that an accurate estimate can be made of the future needs and the weight of loads that it will be called upon to carry. If the traffic study shows that it will be quite a long period of time before the road is called on to carry a great amount of traffic, or that the traffic will be of a type that would not call for a strong surface and will be only for local convenience, then the surfacing will be designed for a maximum load of 16 tons, with a wheel concentration of 5 tons on the rear wheels. No greater load should be allowed over this type of road, except by written permission.

CLASS C, STATE HIGHWAY.

Class C, State Highway will be used through sparsely settled sections of the state and will tie into Class B, roads, making a connected system. The width of right-of-way will be not less than 30 feet, and the surfacing not less than 18 feet. The surfacing will run from a sand clay or top soil road up to a higher type, depending on the availability of materials and climatic conditions. Danger signs of the same design as used on the National Highway System will be used on all state highways, with the exception of a small monogram placed on the sign to show that it is a state highway. Mile posts will be erected and direction signs similar to those on the National System will be used with the exception noted above. The right-of-way will be kept in a neat and presentable condition; all embankments



A Macadam Post Road In Maine-- Note That Maintenance Has Not Been Neglected

being put in grass where possible, and the telephone poles set well back close to the outer edge of the right-of-way. On rights-of-way of this width, no trees of any kind will be planted.

COUNTY HIGHWAYS.

County Highways will be exceedingly variable in the types that will have to be used, depending on the intensity of traffic. They will range anywhere from the highest type of National Highway, down to the earth road, which will constitute the greater number of miles in this system. Same markings and care of right-of-way will be taken that is taken with same class of state highway.

The earth road will be widened out, the right-of-way cleared for its full width, the road kept well shaped up and dragged constantly. Much service can be secured from the earth road by properly maintaining the same, and very much greater care and attention will be given to this class of road in the future than has been given in the past. It will necessarily contain the largest mileage of all other types of roads for many years to come. In the past it has been shamefully neglected and abused, no attempt being made to make it give that service of which it is capable of performing for at least 9 to 12 months during the year, depending upon the severity of the climate and the locality.

The above are classes of roads that the speaker imagines and believes will be in universal use in the next 15 to 20 years in this country and are therefore classified under the heading of "Imaginative Roads."

We will now take up the second heading. The "Speculative Road." Under this heading, as defined in the beginning, we will have to make a close study of what has been done in the past to see what we may expect in the future and what the "Speculative Road" of tomorrow will be. It was about 100 years ago that the National Government and a number of the states started a road building program. The government building a few hundred miles and the states a similar number. Shortly after starting this road program all road building on a part of the National Government and the states ceased and the work was taken up by the formation of many turnpike companies, and the building of a number of toll roads in the Eastern states, and operated under the toll system. After the establishment of the toll road there was quite a long period of quietude in road construction, it being principally handled by the township and county officials, with no development in types of construction, or methods of maintenance outside of the large cities. This condition continued to the late nineties, or practically to 1900, when the states, due to the change in the vehicle and traffic passing over the road saw the coming need of more and better highways, and began to make a study of the problem. This study has been going on for 18 years, and granting some progress has been made, there is by far a greater demand for more and better highways today than ever before, and why is this demand so great? It is because we have not kept pace with the requirements and needs of traffic and the development of the country, therefore, if we should attempt to plan a system of highways, taking the progress of the past 50 years as a basis of calculation, we would fall far below what the requirements of the future will be. One hundred years ago the National Government laid out the right-of-way for its highways 66 feet in width and constructed the surfacing from 20 to 30 feet wide and of considerable depth. Yet today we see the Main State

Highway Trunk lines and the Federal Aid Roads being surfaced from 14 to 18 feet in width, with a right-of-way in many instances not exceeding 30 feet and a thickness of surface incapable of bearing the loads now passing over them at the most critical periods of the year when the ground is saturated with moisture.

There has been also a great reduction in the width of right-of-way and surfacing as well as the thickness of the road crust, since the early period of road construction in this country. All this is misleading for any basis of calculation and design to meet the future needs of the country's transportation. Let us now examine the mileage of roads constructed from 1909 to 1914 and see what progress has been made. From 1909 to 1914, a period of 5 years, there was constructed about 75,000 miles of roads, or so called roads, that is at the rate of 15,000 miles per year.

There are in this country today, under the headings of National Highways, State Highways, and County Highways, with the exception of Class C, County Highway, about 500,000 miles of roads that should be improved and their improvement will be a good investment for the people at large, yet the rate we have been going and using the same character and means of construction, it would take 33 years to complete this mileage, and if we constructed this mileage of highways to meet the traffic needs of today and the future, it will take at least 50 years at the rate of expenditure and progress that has heretofore been made. Therefore, any calculation or speculation we may make, using the mileage as heretofore constructed or what has been accomplished as a basis would give such a small program of construction that it would be a very gloomy day for many of us who hope to see the building of roads put on a basis of at least keeping pace with the development of the country and the needs of transportation.

The development of the different types of surfacing is in its infancy and much study, experimentation and development will have to be made. No field for the manufacturer of road material will offer greater possibilities. It is, however, most important that the highway engineer and the material interests work in closer harmony with each other so that each type can be developed to the highest degree.

In laying out, constructing, and maintaining the American Highways for tomorrow, the highway engineer must not be bound by what has been done heretofore or by any plan based on such accomplishments, but will have to rely to a great extent on his imagination and picture the needs of and use to which the highways will be put to in the future. As a note of warning, may I caution that the limits of his imagination must not be small or restricted, but must be broad and of wide vision.

Many of you will say that this is a dream of a road dreamer, but thank God some bright morning the American people will awake from their slumbers and this dream will be a reality and great will be the benefits therefrom.

C. G. Kershaw, of the Kershaw Contracting Company, of Birmingham, Alabama, has received notice that his company has been granted a contract by the board of commissioners of Daugherty county, Georgia, for the construction of a concrete bridge over Flint river. The cost of the bridge is to be \$263,204. It connects Albany with East Albany and is a part of the Dixie Highway.

Future Road Work In Kentucky

By WILLIAM N. BOSLER

Road Engineer, Department of Public Roads, Frankfort, Ky.

At the present time it is rather difficult to state just what the future policy of this department will be, because many of the present road laws may be changed by the General Assembly which will meet in January, 1920. This being the case, only the program laws and policies as outlined and recommended by the present department can be given, and these must be subject to the changes which the incoming Legislature sees fit to make.

Like many other States, Kentucky has expended millions of dollars on the construction of water-bound macadam roads. In 31 counties of central Kentucky alone you will find 8400 miles of this type. While this includes secondary roads, or rather roads which are classed as secondary, under the present law, which establishes a primary of State-aid system composed of all roads connecting county-seats, still many of these secondary roads receive as much traffic as the primary roads, and hence must receive the same class of construction. It is evident to an engineer, or, in fact, to anyone who has observed the effect of motor traffic on water-bound macadam roads, that this type of surface cannot withstand wear caused by the modern traffic which the advent of motor-drawn vehicles has produced in the rich farming and mining sections of this country. It is evident that in many sections it is impossible to maintain a water-bound macadam surface under such conditions, even where the utmost care is taken, to such an extent that its life will justify the original cost. It is also evident that a surface must be maintained in order to prevent the loss of a base which has already cost the taxpayers of Kentucky millions of dollars.

The department has tried surface treatment both of tar and asphaltic oil on some of these roads, and although it was found that such a carpet preserved the life of the road for a few years, still new construction built in anticipation of such treatment could not be recommended by the department; therefore, the primary roads must be surfaced with a bituminous material or reconstructed of some permanent type, if much progress is to be made in road building in this State.

Before the war the average cost of resurfacing a 16-foot water-bound macadam road was \$2000 or \$3000 per mile. At present the cost of construction of this type has advanced from 100 to 200 per cent, but the road fund has not, in most instances, increased over 50 per cent, and in many counties, it is practically no larger than it was before the war. It is evident that from these facts that a radical change must be made in our road system, even if we desire no more development in highway construction, but only wish to save the money we have already invested.

The Federal Government proposes to aid in the construction of rural postroads if the State will pay half of the cost of construction. To this end over \$5,000,000 have already been apportioned to Kentucky, \$2,000,000 of which must be under contract by the 30th of June, 1920. It is true that a few contracts have been let, and surveys are being made which will require in construction a large part of the \$2,000,000, but the money to finance the counties' share

of the cost was not derived from taxation, in many cases, but from private subscription.

If Kentucky intends for the development of her highways to keep pace with the development of her natural resources, she must create a new State highway system and a larger road fund.

Under the present system there are 6000 miles of primary roads in this State. While the traffic on some of these does not warrant the construction of a high-type road at present, if we are to judge the increase of traffic in the future by the increase of the last 10 years, and intend to construct a type of road which will carry it at a minimum maintenance cost, it will be necessary to construct a type higher than water-bound macadam. Consider, then, the cost of the construction of this system if we build a 16-foot bituminous surface even of penetration, which is the least expensive of the higher type roads, this surface will cost between \$10,000 and \$15,000 per mile, and there are many miles which must also be graded and drained at a cost ranging from \$20,000 to \$30,000 per mile. Consider, then, that the average cost per mile will be \$25,000, which is a very conservative estimate and the total cost of construction for this system will be \$150,000,000.

Under the present system this might be completed in 50 or 60 years if nothing was expended on maintenance, but long before that time the roads which were first constructed would be in an impassable condition and a completed system would never be obtained. The commissioner therefore proposed the following changes:

First—That a primary system of State highways, that will give each county at least one main thoroughfare, be laid out by the road department to the best interest of the county and State, and designated by the General Assembly, and that all State and Federal money hereafter be used on this system until its full completion in each county, before a lateral line is taken up; that the cost be borne principally by the State and Federal governments and maintained by the State. The construction of this primary system will produce continually in a few years, and will reduce the mileage from 6000 to a possible 2500 miles, and at the same time give a system far better adapted to the need of the people and the development of our resources in a much shorter time than attempting the construction of the entire inter-county-seat system. It being understood that in laying out this system the road department would make use of the present Federal-aid projects that have been designated by this State.

Second—That the surveying, construction and maintenance of this system be placed under the road department, and the commissioner be held accountable for this trust.

Third—That there be levied and collected, in lieu of the present three cents, a State road tax of 20 cents on all property on which the State now collects taxes. That in lieu of an ad valorem and all other tax now paid by automobile owners there be collected a horse-power tax of 75 cents on each horse-power, this applying to all pleasure cars only, and that in ad-

dition to this, motor trucks and commercial vehicles be required to pay \$1 per hundredweight up to three tons and \$2 per hundredweight above that.

That a land tax ranging from \$1 to \$4 per acre be placed on all land abutting the road contiguous thereto for one mile on each side. That 50 per cent of this tax be placed on lands over one mile and less than two miles from the road.

These taxes will produce about \$7,000,000 a year, and taken with Federal aid, will give a fund of about \$9,000,000 to be expended on the construction of this system, which will be sufficient to construct the system as outlined in eight or nine years.

Maryland Plans \$30,000,000 Extension.

(By Frank H. Zouck, Chairman, State Roads Commission, Baltimore, Md.)

Maryland is one of the country's pioneer State in building a modern State highway system. It has invested in this system over \$20,000,000 in what is known as State roads and over \$6,000,000 in State-aid roads, making all together nearly \$30,000,000 for a system of highways that is conceded to be one of the most complete and comprehensive in the country. This investment of nearly \$30,000,000 for Maryland's highways represents more money per capita per area and per wealth spent for roads than that expended by any other State in the Union.

Maryland's roads system has also had a tremendous influence upon advocating and encouraging the construction of modern highways throughout the United States. This has been due to the fact that Maryland surrounds the District of Columbia, and members of Congress coming from all parts of the country have had an opportunity of riding over these roads and learning about Maryland's system at first hand, and they have carried back home with them the benefits of the lessons learned and thus stimulated and brought to actual fact the improvement of roads in their respective communities.

Even with the fine system of roads which Maryland has secured, it is thoroughly realized that methods of highway construction are changing all the time, due to changing traffic conditions. With the development of motor-truck transportation there have come conditions which are very different from those of horse-drawn traffic, and these have imposed new requirements to take care of this modern method of transportation. Maryland fully realizes, therefore, the need of so changing and modernizing and extending its present system of highways so they will stand up under this new traffic and be prepared to meet every demand that will be placed upon them.

With this thought in mind, an entirely new program, looking broadly to the future, has been recommended and will very likely be adopted. This plan will provide for a system whereby \$30,000,000 will be available for road work in the next 10 years, to be spent at the rate of \$3,000,000 per year. Maryland will receive on the average of \$750,000 a year of Federal-aid funds, which the State will match with an equal amount, making \$1,500,000 a year for Federal-aid roads. Then it is planned to provide a new system of funds for the building of literal roads and under this plan \$750,000 will be provided by the State to be matched by an equal amount by the counties, making a total of \$1,500,000 for this type of road.

Under this proposed plan the funds provided will cover the cost of building 25 of the most important

bridges on the State highway system in the period of five years; it will build through all incorporated towns within 10 years and will give the smaller counties an average of approximately 30 miles and the larger counties 50 miles of improved roads in addition to those which they now have. It will widen all the State's main roads from 14 to 17 and to 20 feet, and will place 90 per cent of the population in the counties in touch with a State road, and will complete a system that will satisfy the most enthusiastic advocate of modern highways.

Under the Maryland law the funds received from motor vehicle licenses are devoted to highway maintenance, which also includes the reconstruction of roads that have become worn. It has been the principle of this State to invest the State funds in new roads only, leaving to the motor vehicle fund to provide for the rebuilding of such roads where this is necessary and the constant, thorough maintenance of them.

One of the important things which Maryland is doing at this time is to widen and strengthen the roads in its present system. This has become necessary due to modern heavier traffic conditions, and the State has wisely determined to reinforce its roads so they will stand up under this traffic. A general plan has been adopted of building the main highways 20 feet wide, and those next in importance 17 feet wide. This extra width is being secured by building concrete shoulders on either side of the road. Ultimately the center of the roadway will be rebuilt as the road becomes worn, or where traffic conditions require a heavier pavement.

The cost of the work of widening and reconstructing these roads in which the State has already made its original investment will be met by drawing upon the motor vehicle maintenance fund referred to, and it is likely that this fund will be slightly increased to meet the additional costs that will be necessary to bring these roads up to the point where they will stand up under heavier traffic.

From a close observation and careful study of road conditions in Maryland, it is my opinion that no type of road can be built that will not become worn out or obsolete in 20 years under changing and increasing traffic. Therefore, I believe that no road bond issues should be made for a greater period than the life of the road, and never for a period of longer than 20 years. In my opinion, Maryland has been fortunate in having a law which limits the length of terms of bonds to 15 years. The result of this has been that all of Maryland's bonds for road work have been paid off before the roads have become worn out or obsolete.

In the light of my experience, I feel that any other method of raising funds and applying them is wrong in principle and if such a policy should be continued it will lead to bankruptcy.

Over \$11,000,000 for Highways in Tennessee.

Mr. W. P. Moore, Chief Engineer, Department of Highways, Nashville, Tennessee, is quite optimistic concerning the prospects for highway development in Tennessee. To him is credit due for the following information concerning the situation in his State:

This State has a designated trunk line system of highways which connects with the trunk line highways of all the adjoining States. Several such highways have been designated that traverse the State in a general north and south direction. The main east and

west artery of travel will be by way of the Memphis-to-Bristol highway, which when completed will reach from the southwest corner of the State to the northwest corner, and will pass through Memphis, Jackson, Nashville, Knoxville and Bristol.

On State-aid projects there are 40.6 miles of highways under contract at an estimated cost of \$325,-898.45, of which \$182,438.98 had been spent prior to December 31, 1919, thus leaving a balance of \$143,-459.47 remaining to be expended during the present year.

Prior to December 31, 1919, there have been Federal-aid projects approved of the total length of 220.05 miles. Of this total mileage, 11.08 miles were let to contract during 1919 for the sum of \$1,-709,000.54. There has been paid to the contractors on estimates to December 31, 1919, the sum of \$165,715.82, leaving a balance of \$1,543,290.72 to be spent on Federal-aid projects let to contract during the year 1919.

Summarizing the above, it is seen that there is a total of State and Federal funds of \$1,686,750.19 to be spent during the year 1920 on work let to contract during the year 1919.

The present sources of revenue for road-building purposes in this State are derived from the State taxes of one mill levied upon all taxable property in the State, automobile tax, county bond issues and Federal-aid appropriations. The various counties of the State have voted more than \$10,000,000 in bond issues which are to be used in building permanent highways, and it is only a matter of a short time when the predominating influence of public opinion will cause the State Legislature to vote an adequate State bond issue which will put Tennessee in the front rank of the States which have definitely lined themselves in favor of modern and adequate highway facilities.

South Carolina Making Big Plans for Highways.

According to Mr. W. R. Turbeville, of Columbia, South Carolina, the State Highway Department has completed surveys for 635 miles of road and completed plans for 384 miles of road. It has completed or has under construction 203 miles of road and 21 bridges and 19 concrete culverts. Plans have also been completed for 47 bridges and 73 culverts.

In location of roads the department has kept in mind at all times the accommodation and safety of the traveling public and the permanence of the location for all future use, as well as economy in construction.

The department has eliminated a total of 68 dangerous railroad crossings by proper relocation of the roadways and the use of overhead crossings. 9

On January 1 of this year the State Highway Department had received requests for Federal-aid on 21 projects, totaling \$400,000. As soon as the war was over and demobilization under way the department sent its representatives to the various counties in the State, explaining Federal aid and asking the counties to apply for as much Federal aid as they could take up this year. Up to date the State Highway Commission has approved requests for 94 projects, totaling nearly \$2,500,000. This, added to the counties' share, makes approximately \$6,000,000 available for Federal-aid projects. In several instances the counties put up more than 50 per cent of the cost of the project. Most of these requests came

in after April 1, and since that time the department has been exerting every effort possible to get the many projects under way. To do this it was first necessary to secure the services of competent engineers to handle the work.

Georgia Has Available \$12,600,000 for 1920.

According to Mr. C. M. Strahan, Chairman of the Georgia Highway Board, during 1919 the various counties of Georgia have shown a most vigorous activity in raising road funds by the issue of county road bonds. The record shows that 46 counties have issued \$16,730,000 of such bonds.

These issues were mainly inspired, he says, by the prospect of Federal aid, and most of them are limited by the condition that county money shall not be expended until met on a fifty-fifty basis from Federal or State funds. Hence this large sum will be spent gradually when State and Federal funds become available to meet the county expenditures. Based upon this situation, the State Highway Board will probably continue to allow all Federal aid allotted to Georgia to be met by county funds, and will likewise permit the counties to match a portion of the State funds on a similar fifty-fifty basis in certain cases where the counties desire to do so.

The maximum construction program for 1920 would in this way carry the following possible expenditures:

Federal-aid projects from funds arising prior to the current fiscal year, already matched by county funds . . .	\$5,200,000.00
Federal-aid projects from 1920-21, allotment to Georgia when matched by county funds in equal amounts . . .	5,400,000.00
State-aid projects from 1920—income when voluntarily met by county funds	2,000,000.00
Total maximum funds available in 1920	\$12,600,000.00

Roads Get Farmers.

The paramount and most necessary need which stands out superior to all is roads—means of access to and from markets and the uncultivated tracts. It is placing the wagon before the horse to try to induce land owners or contract bidders to locate on tracts with no roads nor bridges. No doubt regarding the productive quality of the land, but what does it avail with no highways to transport whatever is produced? It is a well-known fact that in the large metropolitan centers the transportation lines penetrate the suburbs and outlying districts before people locate and then there is an immediate enhancement in real estate values.

Millions of acres of productive lands are not now under cultivation, because there are no roads from them to the markets.

Good roads will enable the producers to hold their yield for a longer time, thus insuring higher prices for them and lower and more uniform prices for the consumer, and will serve to distribute railway traffic more evenly over the entire year.—The Virginia Motorist.

Covington, Tennessee, is making arrangements for the disposal of \$155,000 in bonds which have been floated for the purpose of hard-surfacing the Jeff Davis Highway.

South Carolina Holds Good Roads Institute

Under the auspices of the University of South Carolina, The Citadel Clemson College, and the State Highway Commission, the State of South Carolina held a good roads institute at the University of South Carolina, Columbia, on March 3 and 4. The program for the occasion was as follows:

Place of Meeting: Le Conte College

University Campus

PROGRAM

Wednesday, March 3, 1920

9:30 a. m.—11:00 a. m.—Registration of Attendants.

Morning Session.

Presiding Officer—A. M. Gibbes, President, Gibbes Machinery Co. of Columbia, S. C.

11:30 a. m.—Address of Welcome—Dr. W. S. Currell, President, University of South Carolina.

Purpose of the Institute—Mr. C. O. Hearon, Member State Highway Commission.

State and County Highways, Their Relations and Functions—Mr. R. Goodwin Rhett, Charleston, S. C.

Road Surfacing Materials in South Carolina—Prof. Stephen Taber, Department of Geology, University of South Carolina.

Bond Issues for County Roads and the Necessity for Adequate System of Maintenance—Mrs. W. C. Hamrick, Chairman, Cherokee Co. Highway Commission.

The Obligations of Land Owners as Regards the Construction and Care of Roads—Mr. D. R. Coker, Farmer and Merchant, Darlington, S. C.

The Duty of the County Road Official to the Country Church and School—Rev. J. A. J. Brock, Supervisor State Survey, Inter-Church World Movement.

Afternoon Session.

Presiding Officer—S. B. McMaster, Columbia, S. C.

2:30 p. m.—The Squad of Road Maintenance—Mr. D. H. Winslow, Engineer, N. C. Highway Commission.

Road Maintenance in Cherokee County—Mr. Geo. C. Stanley, County Engineer.

Road Maintenance in Greenville County—Mr. W. H. Willimon, County Supervisor.

General Discussion—Led by Mr. A. L. Ervin, Supervisor Florence County.

Patrol System Road Maintenance—Mr. H. G. Shirley, Former State Highway Engineer of Maryland.

8:30 p. m.—Illustrated Lecture by Representative of the U. S. Bureau of Public Roads, followed by A Smoker in Flynn Hall, University Campus.

Thursday, March 4.

Morning Session.

Presiding Officer—Frank E. Broadnax, Columbia, S. C.

9:30 a. m.—Top-Soil Roads—Mr. P. F. Patton, County Engineer, Spartanburg County.

Discussion—Led by Mr. L. M. Weisiger, Resident Engineer, State Highway Department.

Drainage Structures and Sub-Drainage—Mr. N. C. Hughes, County Engineer, Laurens County.

Discussion—Led by Mr. H. C. Orr, Bridge Engineer, State Highway Department.

Road Location—R. T. Brown, Chief of Surveys, State Highway Department.

Discussion—Led by Mr. W. S. Lewis, County En-

gineer, Marion County.

Care of Road Equipment—Mr. H. H. Kester, County Engineer, Lancaster County.

Discussion—Led by Mr. C. E. Corley, Supervisor, Lexington County.

Hard Surfaced Roads—Mr. F. H. Murray, Chief of Construction, State Highway Department.

Discussion—Led by Mr. Jas. W. Martin, County Engineer, Charleston County.

Afternoon Session.

Presiding Officer—L. L. Hardin, Richland County Highway Commission.

2:30 p. m.—Relations of The Highway Engineer to Successful Road Location, Construction and Maintenance—Mr. T. F. Hickerson, Professor of Civil Engineering, University of North Carolina.

Discussion—Led by Capt. J. Roy Pennell, State Highway Engineer, South Carolina.

Culverts and Bridges—Mr. J. W. Barnwell, Bridge Engineer, State Highway Department.

Discussion—Led by Prof. Hickerson.

Sand-Clay Roads and Their Maintenance—Mr. L. P. McMillan, Supervisor Bamberg Co.

Discussion—

Reports on County Roads Work—By County Supervisor and County Engineers.

Virginia Has In Sight \$12,000,000.

District Engineer C. S. Mullen, of the Virginia State Highway Commission, says that for the year 1920 the prospects for making a serious start on construction of the State system are excellent, and during 1920 and 1921 available funds in sight for construction and reconstruction amount to approximately \$10,000,000. Contracts are being let as rapidly as possible, and by the time open weather for road work is at hand highway construction, he adds, in Virginia will be well under way.

In addition to the money appropriated for construction, two-thirds of the proceeds derived from the payment of licenses for motorcycles, automobiles, and trucks will be devoted to the maintenance of such sections of the State highway system as are now in condition to be maintained.

Approximately \$700,000 has been appropriated by the State as State money aid, and with an equal expenditure by the counties, will give a fund of \$1,400,000 for work on our county highway systems.

From all sources, and for construction, reconstruction and maintenance of both the State and county highway systems, Virginia will have available for the year 1920 approximately \$12,000,000.

Mississippi Counties Have \$15,000,000 for Highways

State Highway Engineer Xavier A. Kramer, of Jackson, Mississippi, says that according to calculations the counties of the State have on hand approximately \$15,000,000 for road construction, much of which is under way. These funds, together with the amount of Federal aid available for road construction, is evidence of the fact that an adequate State Highway Department must be maintained to assist the counties in the expenditure of this vast fund and to administer the Federal-aid money.

There is also before the Legislature a \$25,000,000 bond act which has been recommended by the State Highway Department and the Mississippi Highway Improvement Association.

Great Era of Road Construction

By H. W. DOUGHERTY

Professor Civil Engineering, University of Tennessee

The United States is entering upon the greatest construction program for highways ever known to any nation at any previous time. During the next five years there will be at the disposal of the State Highway Departments a grand total of as much as \$3,000,000,000.00. The program is outlined for the year 1920 looks to the expenditure of more than \$600,000,000. At no time in the history of the world have such vast sums of money been made available for any particular line of work. The greatest era of railroad construction came between the years of 1879 and 1883 and the expenditure was something like \$800,000,000.00, and this under the five-year period. During that time some 400,000 miles of railroad were constructed at a cost of about \$20,000 per mile. Considering the advance in price of labor and engineering material as being one hundred per cent, still the actual amount of work to be done now is far above that which was done during this great period of railroad construction.

When any state enters upon such a construction program, great engineering and transportation difficulties will arise. Vast amounts of materials must be moved from places of origin to the places where they are used in construction. This will make a very great demand upon our present overburdened railroad system. Plans should be laid far in advance in order that materials may be placed on the ground by the time construction begins. The government of the United States is attempting to assist the State Highway Department as much as possible in the handling of materials. Large numbers of army trucks and tractors have been placed in the hands of county and state officials and those may be used in motor truck transportation. A need, however, will be strongly felt in this direction. Trained operators must be secured to care for these vehicles and many of the counties will find it necessary to install a motor transportation department.

The problem of obtaining a sufficient amount of labor to do more work than the railroads did during their great construction program will be a serious one. Forethought must be used to prevent the diverting of labor from other needed industries and placing it upon the highway program. The possibility of competitive bidding looms up when such vast amounts of money are to be expended.

With the prospect of large amounts of money being expended on highway construction the large construction concerns are entering the highway field. In order that they may be attracted to it large pieces of work must be prepared and offered for bids at the same time or at short intervals. Large construction concerns cannot take small pieces of work and do them effectively. The entrance of large construction companies into the highway field will relieve the situation to a large extent. Otherwise competitors bidding between the counties might make a serious problem in getting contractors into the work.

In the State of Tennessee there will be \$8,000,000 worth of work done during the year 1920. This will require large numbers of men and vast amounts of road materials. The supervision alone will comprise

a very large item. Usually it is considered that about five per cent of the expenditures should go to engineering and supervision. Five per cent of the \$8,000,000. will be \$400,000, which would employ 200 men at salaries of \$2,000 a year.

With the need of two hundred engineers in the State of Tennessee the problem is apt to be acute. A highway engineer cannot be made over night. He should have a four years' training in a university, with considerable practical experience in highway construction and supervision. We cannot wait until the men are graduated from the universities. We must have men trained in the fundamentals at the earliest possible moment.

In order to meet this demand the universities are putting in short courses in Highway Engineering to be given, during the dull season of the year, to those men who expect to enter into highway work. At the University of Tennessee this course will be given from January 12 to February 20.

Good Roads in France

(By J. W. CARR, Jr., Second Lieutenant, Eleventh Field Artillery, A. E. F.)

During the last few years argument in favor of good roads has become superfluous. The time was, several years ago, when the advocate of better highways had to convince the public that he was right. Now all men—the farmer, the laborer, and the business man—are persuaded that the one thing which is needed to make our present prosperity permanent is to build a net work of the best possible roads from one end of this country to the other. The latter part of the Nineteenth Century has been called the age of steam, a period during which a system of railroads was built which has made modern civilization possible. The first part of the Twentieth Century will be known as the age of gasoline, during which time, the automobile and motor truck, traveling over highways connecting every town and village will bring to fruition our fondest dreams of efficiency and prosperity. The automobile age is now here. No one who has seen the hundreds of machines parked on the streets of any large North Carolina town can doubt that a new method of transportation, which equals the railroads in importance, has been developed. We have now the rolling stock of the future, but in our state much of the track is yet to be laid.

Every one is convinced that we must have up-to-date roads, but the natural inertia and conservatism of our people must be overcome. For this reason all thinking men welcome and support the agitation for road building which is being conducted by public spirited citizens through conventions and highway commissions. The men who went to France came back more than persuaded of a need for better highways in this country, and determined to help remedy existing lack of properly built roads. A short account of some of our observations "over there" may serve to impart to others the enthusiasm which we feel.

In France the regular type of road resembles our macadam in most respects. Instead of the granite

rock which is used in the state, most frequently a white limestone is employed. After exposure to the weather and wear, roads covered with this substance have a very smooth and compact surface. The great age of the French thoroughfares probably accounts for their wearing qualities. Layer after layers of stone has been packed down for centuries. Sometimes military routes built by Caesar during his Gallic wars form the basis of modern roads. At the front one often saw the stone surface worn away a foot or more below level by heavy traffic. Engineers merely shoveled off the pulverized rock, and a firm base was always found.

French construction does not follow our idea of center crowning—of making the middle high and the sides low to insure drainage. The surface is practically flat, but water is carried off by means of small trenches leading diagonally into the ditches at each side of the road. Turf is frequently used to prevent washing of the surface material.

The maintenance of these roads is accomplished by methods which we would consider antiquated. A farmer is assigned the job of keeping up a section of the highway. For his work he is paid a very small salary, but is allowed certain valuable privileges. Among these is the right to cut down the trees which are spaced with beautiful regularity along all the state thoroughfares. Wood is so scarce there that this brings quite a neat sum to the workman when the trees are matured. His engineering equipment consists of a sledge hammer, a wheel barrow, and a shelter made of straw. Often in mid-winter one will see this primitive road-mender, his thatched shelter in position to keep off the coiling wind, crouched over a rock pile by the side of the road. He gathers his stones from the nearby fields, and fills the holes before they can become ruts. This method of maintenance is old-fashioned, but from the uniform good condition of French highways, one is forced to admit that it produces results.

While the American army was using the roads of France, they were kept in repair by soldier labor. Our engineers did heroic work under fire at the front, filling shell holes—sometimes with rock, often times with their own dead bodies—in order that the supplies might go forward. After the armistice, back in the training areas, men in all branches of the service were used for this work. Frequently one saw a man, who was possibly a prominent lawyer or newspaper editor back home, seated beside a rock pile on a cold winter day, "making little ones out of big ones," as the "Buck" always expressed it. When our leaders of thought over here put such personal effort as this into the campaign, our dream of good roads will be realized. Why should our government not be as interested in building better highways in this country as it was in keeping those in France in good condition?

The completeness of the network of good roads in France can be shown by several facts. Bicycle riding is the most popular sport in this country, and one can go anywhere with this means of conveyance. Automobiles are as yet too expensive to be popular, but everyone owns and uses a bicycle. The excellent condition of thoroughfares from one end of the country to the other is shown by the United States army method of shipping motor transport material. It was found that trucks and automobiles could be sent more cheaply and quickly over land than by freight. The congested condition of railway traffic made this necessary at times, and large convoys of motor vehicles

were sent from Marseilles, Bordeaux and Brest to the front. The trucks were frequently loaded with much needed supplies, and a regular "ship by truck" system was organized. Our government could scarcely have maintained such immense supply depots as those at Is-Sud-Tile and Nevres without the French system of good roads.

In fact, it has been truly said that the roads of France saved her life during the war. They were the arteries that carried the strength of the nation—the provisions, the shells, the guns, the soldiers—to meet the German onslaught. From Bar-le-Duc to Verdun there runs a broad highway, surfaced with bithu-lithic, as wide as an American city street.

During the great battle of 1917 this was the main route open for shipping supplies and reinforcements to this vital point. Then this road was truly the cardiac artery of the nation. The life of France depended upon it. The highway stood the strain; the "Boches" did not pass, and now this route has been christened "La Voie Sacree," the sacred road. What this and other highways did for France during the crucial moments of the war, a similar system will do for North Carolina during the era of reconstruction. Good roads will carry the current of prosperity into every nook and corner of our state.

\$60,000,000 Bond Issue in Missouri Proposed.

To abolish the mud tax in Missouri by building 6,000 miles of state highway, to be paid for from automobile licenses, is the purpose of the \$60,000,000 bond issue which the people of this State will vote on in November of this year. An amortization table has been made based on the fact that the net receipts into the road fund for 1919 were \$1,562,024.77, an increase of 25 per cent over 1918. The same percentage of increase has been used in making estimates for 1920 and 1921; for the next three years the increase has been placed at approximately 10 per cent, and for each succeeding year, of the thirty, no increase has been figured.

If the bond issue is approved by the people in the fall of 1920, it is said, the Legislature would work out the details in 1921, and the way would be prepared to start the work in January of 1922; hence the receipts in to the road fund for 1920 and 1921 are not figured as available for the payment of the bonds, but are to be retained for the completion of projects to be approved by the State Highway Department in 1920.

Florida Quick to Take the Initiative.

Florida was one of the first states in the South to take advantage of the Federal Good Roads and act of Congress. Before that it was one of the first States to create a department of highways. The passage of the good roads bill in Congress made it mandatory that every State participating in Federal aid should have a well established and well provided for State road department through which the federal government would spend its money. As a result of Florida's early establishment of this now very important branch of the state government, Florida is to be one of the very first States in the South to participate extensively in the federal aid program and show results. Many miles of state highway will be built and in use before many of the other States even qualify to participate in the fund the first years allotment will be spent on this State. Under the federal law governing the States desiring it the aid provided for in building up State

highway systems, the State must match dollar for dollar in labor and material or currency the federal allotment. The first two-year program calls for an expenditure of \$3,000,000 in federal moneys in addition to a similar amount which the last legislature took care to see would be provided. A special assessment of one mill to meet the government allotment was provided. While this does not in itself match dollar for dollar the government money provided, the remainder is made up of State convict and other labor. Thus Florida will within the next two years spend on state-owned and maintained highways alone the sum of six million dollars. The program for the next two years following will provide for an even greater sum and the year following that will close up the five-year program contemplated by the federal good roads act. By that time Florida will be well on the road to a well nigh perfect system of state-owned highways.—Virginia Motorist.

Make the Highway Foundation Conform to Local Conditions!

(By George C. Diehl, County Engineer, Erie County, New York.)

From The Highway Magazine.

Men having practical knowledge of road-building matters take into account the fact that local conditions, involving the availability of material, the character of the soil, the drainage facilities and other governing factors, might dictate in one case a wholly different type of foundation from that which would be found suitable in another case.

With our 2,500,000 odd miles of roads; our 3,000,000 square miles of area, and our 105,000,000 population, we must utilize every means of making our highway system serve the most tonnage, the greatest number of people, and the largest possible number of needs. We must build some highways wider and some thicker than others. We must avoid jumping at conclusions based upon new and plausible theories as contrasted with fully ascertained facts.

Twenty per cent of our highways, or 500,000 miles, at \$40,000 per mile, the cost of many present-day State roads, would aggregate \$20,000,000,000 at the first cost! If therefore, within the present, or even the next generation, we are to have a connected and well-developed system of highways, aggregating one-fifth of the total mileage, it is perfectly plain that a large percentage must be built of less expensive types. But, of course, every one of the standard proven types has its place in the completed system.

There is no wholesale method of determining types, materials of construction, cross-sections, etc., but every section must be designed to meet its own particular needs.

The county officials of Davidson and Rowan, North Carolina, are making preparations for building a double-track bridge across the Yadkin river on the National Highway. This bridge will take the place of the old, single-track toll bridge which now spans the river, unless the officials come to terms with the toll bridge owners for its purchase. This toll bridge has been a drawback to highway development between Lexington and Salisbury, the county seats of the two counties, and the citizens, as well as tourists, welcome this move for a free, double-track structure.

Mr. Pollard Accepts Position With Kentucky Rock Asphalt Company

Mr. W. F. Pollard, who has been connected with Mr. Gilbert C. White, one of the largest consulting engineers in the South, has accepted position with the Kentucky Rock Asphalt Company as sales engineer in the states of Virginia, North and South Carolina, with headquarters at Greensboro, North Carolina. Mr. Pollard is well qualified for the position he will fill, for he is a civil engineer and he specialized in highway engineering in a course leading to the degree of A. M. in Columbia University. While taking this course he made a special study of asphalt and its relation to highway construction under Mr. Prevost Hubbard. Mr. Pollard was appointed student assist-



MR. W. F. POLLARD

ant in the U. S. Office of Public Roads and Rural Engineering in the fall of 1915. He filled this position until the spring of 1916, when he was appointed asphalt expert for the Highway Department of the State of Kentucky. He filled this position until he went into the army in the fall of 1917. Upon his discharge from the army he returned to his former position but soon thereafter resigned and accepted a position with Mr. White to handle his asphalt inspection. While in Kentucky he came in contact with Kentucky Rock Asphalt, realized the merits of the material and the part it must play in our enlarged program of highway construction, and has now identified himself with the company which produces this paving material.

Men and Money Available.

Of encouraging interest to those who hope some day to see the United States close-bound by a well-planned system of roads is the recent report that of 127 technical schools throughout the country, 115 are now giving courses in highway engineering. Such response of the colleges to popular enthusiasm not only gives permanence to the "good roads" movement, but proves that the road work of the future is to be in expert hands. And that those college-trained men are to have to do is shown by another report, which reveals that the treasuries of counties, states, and nation now hold a grand total of \$1,300,000,000 for road building and maintenance.—Popular Mechanics.

Delaware, Connecticut, Florida, Georgia, Idaho, Kansas, Louisiana, Maine, Michigan, Mississippi, Minnesota, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Virginia, West Virginia and Wyoming.

Included in the equipment are 1,500 field ranges formerly used by the army. It is expected that these will serve conveniently in preparing meals for construction gangs doing road work. Concrete mixers, concrete carts, excavators, clam-shell buckets, plows, tractors, reinforcing steel scrapers, hoisting engines, and various materials were also prorated among these same States.

Senator Bankhead, Good Roads Advocate, Dead

John A. Bankhead, of Alabama, the oldest member of the United States Senate and the last veteran of the Confederate armies to serve in it, died March 1 at his home in Washington of myocarditis.

The death of Senator Bankhead removed one of the strongest advocates of improved roads in this country. Flowers in tribute to his memory were sent by the American Association of State Highway Officials, which is composed of the heads of the State highway departments and of officials of the Bureau of Public Roads, United States Department of Agriculture.

Senator Bankhead, who was chairman of the Senate committee on post offices and post roads, was the author of the original Federal Aid Road Act under which a great program of cooperative highway construction is now in progress, and he was largely responsible for the adoption of amendments providing additional appropriations under the Act.

Thomas H. McDonald, chief of the Bureau of Public Roads, recalls a statement of Senator Bankhead that his first speech in Congress was in advocacy of help by the Federal Government in the building of good roads. The speech was made when Senator Bankhead had just entered the House of Representatives, and at that time, the Senator said, his colleagues considered the project unbelievable. He was known as the "Father of Good Roads" in the United States Senate. He was perhaps the greatest and most effective good roads advocate in the United States. He was one of the founders, the first and only president that the United States Good Roads Association has ever had.

Good Roads Convention, June 16-17-18

The annual convention of the North Carolina Good Roads Association, meeting simultaneously with the North Carolina County Commissioners Association, will be held in Asheville from June 16 to 18, inclusive, it has been announced. Significance is attached to the meeting because of the efforts the association will make to secure a \$50,000,000 bond issue from the special session of the Legislature for good road work in the State.

Oklahoma Has Big Plans for Road Building

According to Max L. Cunningham, State Engineer, Department of Highways, Oklahoma City, Oklahoma, department has at this time under contract or under agreement with the Bureau of Public Roads approximately 200 miles of highway construction, running from gravel to all of the higher types of construction, and it is confidently expected that before the end of the calendar year 1920 work aggregating not less

than \$7,000,000 will be under construction or completed as part of the State-Federal-aid program. Approximately \$600,000 of this fund will be spent on the building of important bridges which are made necessary by the enormous expense of bridging the overflow streams rising in the Rocky Mountains and flowing across the State, which in most cases are county line boundaries and which have been the greatest obstacle to cross-State traffic in the past.

Mr. Cunningham says he believes the year 1920 will be the first really big year of Oklahoma highway work.

New Mexico After Good Roads

Governor O. A. Larrazolo, of New Mexico, in a recent discussion of the public lands of the Western States, gave the following interesting facts concerning road building in his State:

"In New Mexico there are 43,891 miles of road actually in operation and use, and during the years 1917, 1918, and 1919, we spent \$2,936,597, raised by taxation, in addition to \$249,976 derived from federal aid in the construction of roads in that state. The road building program for the year 1920 and 1921 in my state involve the expenditure of \$5,479,923, which must be contributed by the federal and state governments respectively on a 50-50 basis; in addition to this the state alone will spend in the next two years the sum of \$2,058,609 in the maintenance and upkeep of those roads."

Water a Big Item in Road Work

Every contractor who takes a contract to build a concrete highway has to consider the important item of water.

For every square yard of highway, an average of fifteen gallons of water is required, according to Mr. M. W. Watson, Kansas State Highway Engineer. This water cannot be carried successfully in wagons because the water must be sprinkled on by hose over a period of fifteen days during the mixing and curing processes.

Highways of brick have concrete bases and these must be watered. The cost of water for highways must be considered.

West Virginia Has \$15,000,000 for 1920 Road Building.

Chairman C. P. Fortney, of the West Virginia Road Commission, says the State is preparing rather an extensive program for this coming year, as will be shown by the following figures: There will be available from State aid, \$3,000,000; county taxes, \$3,000,000; county bond issues amounting to \$9,000,000 or more. This makes a total for the year 1920's program of \$15,000,000. With what is now under contract and with what is now contemplated, it is proposed to construct approximately 300 miles of hard-surface road and 200 miles of graded earth roads.

Goods Roads Meeting Postponed.

The Southern Appalachian Good Roads Association which was scheduled to meet in Asheville, North Carolina, February 26, 27, and 28 has been postponed till later in the year on account of influenza.

The heavy supplemental steel piers to be used in repairing the Pitts bridge over the Brozos river, ten miles from Bryan, Texas, have arrived and are being moved out to the bridge.

The Actual Cost of a Mile of Road

By GEORGE A. DUREN

Former State Highway Engineer of Texas

The population of Texas is 28.43 people per mile of road, according to the 1913 census, or 233.79 people per mile of designated State Highway. The assessed valuation of Texas is \$17,297.02 per mile of highway, or \$144,444.44 per mile of designated State Highway. Texas has been spending for a number of years a fifteen-cent road and bridge tax on these highways, which amounts to an average of \$26.29 per mile per year. This is at the rate of 92 cents per capita per mile per year that the road has cost.

This cost may also be expressed as \$15.00 per year on all motor vehicles, or three cents per gallon on all gasoline used by motor vehicles, which in railway operation parlance would be expressed as one-half cent per ton mile on all highway traffic. Another rule is: The cost per mile of road per year is equal to, in dollars, the number of vehicles traversing said mile of road per day.

All highway authorities have been dealing with highway construction and maintenance almost solely in an effort to deal with this subject at the least possible cost on the part of the tax-payer, with little or no consideration for the cost of transportation. This article is to call attention to the combined cost to the tax-payer and to the user of the highway.

Figures are given herewith to show the cost per ton mile, including the transportation cost per ton mile, paid by the user of the highway and the cost per ton mile of the highway itself, which is paid for by the tax-payer in highway construction and maintenance.

The authorities agree that a 9-foot gravel road is a satisfactory and economical highway for traffic not to exceed 200 vehicles per day, and that a 16-foot gravel road is a satisfactory and economical highway for use of vehicles not to exceed 500 per day. Authorities differ concerning the automobile highway for general opinion is that for this traffic some form of traffic of from 500 to 1,000 vehicles per day, but the bituminous surface is most satisfactory. It is suggested that for traffic exceeding 500 vehicles per day and not exceeding 750 vehicles per day a macadam road with bituminous surface treatment should be used; and for traffic exceeding 750 vehicles per day and not exceeding 1,000 vehicles per day, a substantially-built asphalt macadam construction should be used. Traffic exceeding 1,000 vehicles per day should be served with a concrete paving, not less than 16 feet wide. For traffic amounting to as much as 2,000 vehicles per day, a concrete pavement 20 feet wide should be used and that for traffic exceeding 1,500 vehicles per day, a brick pavement is desirable. Traffic exceeding 2,000 vehicles per day should be served with a pavement not less than 20 feet wide, and constructed with concrete foundation not less than 5 inches thick with brick, wood block, rock asphalt, sheet asphalt, granite block or some form of asphaltic concrete not less than 2 inches thick should be used.

These conclusions are probably in keeping with

economy when viewed only by the cost of building and maintaining the highway under the varying intensities of traffic for units formerly used. All of these types of construction are such as will enable traffic such as formerly was found on the highways to continue 365 days a year. Traffic amounting to less than 50 vehicles per day has been provided for by earth roads, occasionally graded and dragged. Traffic amounting to 1, 5, or 10 vehicles per day has been accustomed to getting along over the natural surface of the ground.

The approximate costs of transportation are as follows: Upon an unimproved road, 30 cents per ton mile; on an improved earth or sand clay road, 25 cents per ton mile; on a hard gravel road, 20 cents per ton mile; on a bituminous surfaced gravel road, 15 cents per ton mile; on a concrete or brick road, 10 cents per ton mile.

The tonnage of traffic is assumed at one-half the number of vehicles, and the annual cost of the road assumed also is conservative and most favorable to the cheaper roads.

The cost of a road is essentially an annual cost. Man has not yet constructed a permanent highway, for no highway has yet been constructed which, if it is used, does not require expenditure for maintenance.

A permanent road is a road that is permanently maintained. The cost of a mile of road is the cost per mile of road per year. Too much attention is given to the original cost of construction and too little interest and attention is given to the cost of permanent service. A rational study of the cost of a mile of road must be arrived at by adding the interest on the original investment to the cost of annual maintenance necessary to retain the original structure. This seems all that must be considered as a part of the cost of the road; however, the most important matter to be considered is the cost to the traffic using the highway as affected by the condition of the highway.

The use of the road occasions a cost to traffic amounting to a certain rate per ton mile. The improvement of the road is an economic waste unless a saving is effected by its expenditure as an investment in reducing the cost of the traffic using the road. The cost per mile of road per year should never exceed the reduction in the cost of transportation using said mile of road, made possible by the improvement.

E. H. Harriman is remembered as being a railway wizard as well as a financial genius. He took over unprofitable railways and bankrupt railways and spent millions of dollars on these losing ventures to improve the roadway, reducing the grades and laying heavier rail and building better track. He did not reduce the cost per mile per year of maintaining the track thereby, but he did reduce the cost per ton mile of all traffic using the road, thus transporting the tonnage at an enormous saving which went into dividends. Yet he was able to accomplish only the small saving of approximately one-half of one per cent per ton mile.

\$4,000,000 for Alabama's 1920 Road Program

By W. S. KELLER

State Highway Engineer, Montgomery, Alabama

Alabamians are determined to get their State out of the mud. To do this it has been found necessary to pass legislation allowing the people to vote on a constitutional amendment authorizing the issuance of State bonds. The 1919 Legislature was thoroughly awake to the necessity for definite action on this great question, and passed by only three dissenting votes the necessary enabling act. On February 16 the election to determine whether or not there shall be issued \$25,000,000 good-roads bonds will be held. It is almost certain that the issue will carry by a very large majority.

The law requires that the proceeds from the sale of bonds shall be used in the construction of roads that connect the various county seats, and that there shall be an equitable apportionment among the counties of the expenditures of both money and labor, and the time or times of making such investments, and the roads are to be constructed without expense to the counties.

In order to pay the interest on the bonds, create sinking and maintenance funds, the entire net revenue received by the State from licensing of motor vehicles will be used exclusively.

It has been shown that the bonds can easily be retired serially, beginning in 1924, and completed in 1941, and ample funds left for maintenance. At first glance this might appear to be unfair to the automobile and truck owner. If the owners of motor vehicles felt that this was true, they unquestionably would oppose the issue. On the contrary, they are practically unanimous in the support of it and are financing the campaign. They realize the vast saving to be gained in fuel and wear and tear on machines over a system of good roads compared to the present system of mud roads.

It is the purpose of the State Highway Commission to construct modern roads—roads that will sustain the traffic of today and the estimated traffic of tomorrow. This means that the major portion of the system will be of the very best material available. It is estimated that 2,500 miles of modern road can be constructed for \$50,000,000. The expenditure of the fund will cover a period of twelve years, and it is confidently expected that the Government will from time to time make additional appropriations, thereby giving Alabama, including the present allotment of \$5,700,000 as much as \$25,000,000.

During the present year it is planned to contract, if possible, \$4,000,000 worth of work, one-half of the cost to be paid from the Federal aid fund.

Alabama's plan is modelled after that of the State of Illinois, and is unquestionably practical.

Want \$50,000,000 in Bonds for North Carolina Highways

In a regular meeting at Wilmington, North Carolina, on January 5 the Board of County Commissioners of New Hanover county adopted resolutions requesting the General Assembly of North Carolina to give authority to the proper State authorities to issue serial bonds to the amount of \$50,000,000 for

the purpose of giving more substantial aid to the different counties of the State toward building the main highways in the State, the money to be expended under the supervision of the State Highway Commission.

It has been stated that certain counties of the State are unable to construct the main highways and the local county roads leading to the main arteries owing to the failure and inability of the State on account of lack of funds to give adequate aid to the counties, and it is believed that the State should provide more funds.

Highway Primer

By D. H. WINSLOW,
RALEIGH, N. C.

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Good Roads Notes In Brief

In his biennial message to the Mississippi legislature recently Governor Bilbo urged a \$25,000,000 issue for good roads to be supplemented by a similar sum from the federal government.

The county court at Somerville, Tennessee, recently authorized an issue of \$100,000 worth of bonds, an issue of the \$500,000 authorized for the good roads program of the county.

Much interest is centered on the move of Kentucky toward building a highway from Winchester via Stanton Jackson Hazard, Whitesburg, and other progressive mountain towns to the Virginia border at Pound Gap, a distance of about 300 miles. This would form an important connection with one or more of the splendid highways in southwestern Virginia.

Anderson County, (Tennessee) Court has voted \$85,000 bonds for rebuilding the Dixie Highway eighteen miles from the Campbell county line to Knox county line.

Issuance of road bonds which will result in expenditure of a sum in excess of \$500,000 in Hardeman county, Tennessee, will take place during the present term of the County Court, according to Mr. T. B. King, Chairman of the Chamber of Commerce Good Roads Committee.

The County Court of Marshall county, Tennessee, in regular quarterly session, ratified the issuance of \$200,000 of bonds to be used in connection with the state and federal aid in the building of two highways through that county.

One and one-half million dollars for 100 miles of concrete roads in Fayette county, Tennessee, became an assured fact recently when a committee appointed at the October term of the quarterly court of Fayette county signed a contract with the State Highway Commission at Nashville for the project.

At the last meeting of Shelby, Mississippi, Chamber of Commerce the subject of good roads for Shelby district was taken up and a committee appointed to circulate a petition to order an election to vote on a \$400,000 bond issue to build 50 miles of good roads in this district.

The city of Louisa, Kentucky, came over strong for the Lawrence county bond issue, voted on December 20, and only nine were recorded against it. It was overwhelming for good roads.

Lawrence county, Kentucky, by overwhelming vote has sanctioned a bond issue of \$250,000 for road improvement which, with the state and national aid, will make a total of \$1,000,000 to be spent for good roads in this county.

Authorities are considering a proposition to construct a bridge across the Ritter mill stream near Springfield, Missouri.

The Bonham, Texas, Board of Trade is contributing subscriptions to a fund for the construction of a bridge across Red river.

Information from Ft. Smith, Arkansas, is that Pritchett & Fry Company, of Little Rock, has a corps of engineers now at work on the western district of Crawford county highway. It is reported that the

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bonds for the road will have been sold and complete estimates will have been compiled for the district by April 15.

The proposition of the county building three free bridges across the Arkansas river were discussed at a meeting of the Chamber of Commerce, Muskogee, Oklahoma, recently.

The sale of \$250,000 worth of DeKalb county, Georgia, road bonds to the Central Bank and Trust corporation, of Atlanta, was announced Tuesday by L. T. Y. Nash, commissioner of roads and revenue. The corporation paid par value for the bonds with accrued interest from January 1, 1920. This is the first instalment of the \$800,000 bond issue to be sold and it is taken to indicate that the road construction for which the issue was voted, will be immediately begun.

Atlanta, Georgia, is about to start on the most extensive street paving program put underway at one time in Atlanta in recent years involving an expenditure of more than \$200,000 on four main projects.

Less than \$100,000 was expended by the department of public works, of Richmond, Virginia, out of the \$500,000 made available for street improvements in 1919, according to a report made by Director Charles E. Bolling. Contracts signed, the report shows, call for the expenditure of \$458,137.67.

Through its action in accepting the alternated bid of James Y. Wilson, Incorporated, general contractor, of Jacksonville, for the construction of approximately fifty-four miles of grouted brick pavement sixteen feet in width, on state road No. 1, between Jacksonville and Lake City, the State Road Department of Florida has gone on record as entering into the largest con-

tract for brick paved roads ever awarded in this State, and probably the largest in the South. The expenditure will approximate \$2,000,000.

The Missouri State Highway Department has been informed that the Bureau of Public Roads at Washington had approved the plans for four road projects in St. Louis County, to be constructed at a cost of almost \$2,000,000.

Surveys for a new federal highway reaching across Newton county, Missouri, from Seneca to the Barry county line east of Granby, have been completed. The highway will be approximately forty miles long in Newton county and will cost about \$200,000, based on the present estimate of \$5,000 a mile. Half of the cost of the road will be paid by the State and Federal governments and the other half by the residents of the county.

Despite adverse conditions, which began early last fall and which have continued through the winter, the work of constructing the earth embankments and bridges in Crittenden county, Arkansas, in districts five, seven, eight and nine has gone steadily forward, according to the Memphis, Tennessee, Commercial Appeal. These four districts include the greater part of Crittenden county and have under construction about 175 miles of roadway. This system includes the main road leading west from the end of the viaduct across the river from Memphis and following the Frisco Railroad to the north line of the county.

Contracts for 65,000 square yards street paving were let to Capt. James Y. Wilson, Jacksonville, Florida, for paving various streets of Jacksonville to the amount of approximately \$300,000; all to be constructed of paving brick.

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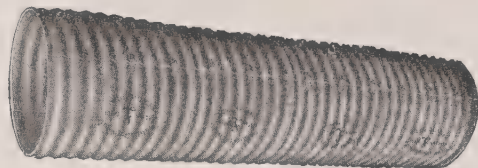
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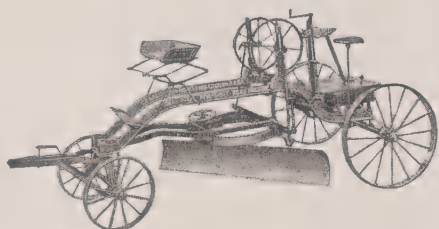
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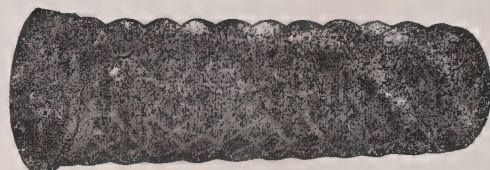
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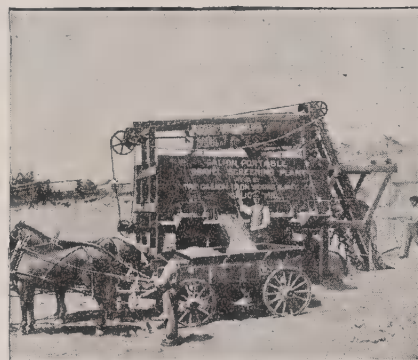
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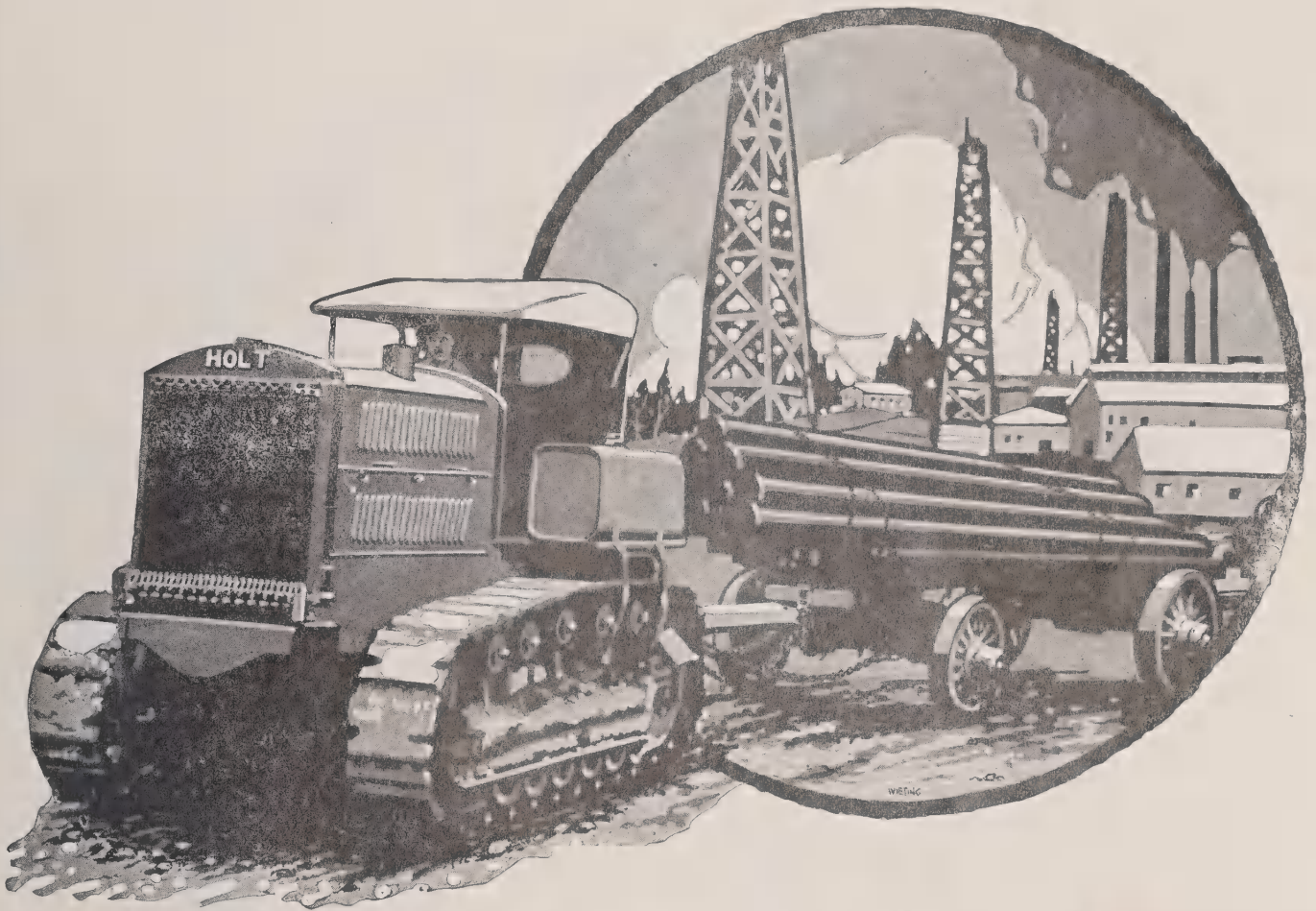


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EASE OF CONTROL—The "Caterpillar" controls more easily over rough ground than a motor truck does on a good road. Turns in twice its own width. Automatic gas control makes hills and hollows look alike.

POWER AND TRACTION—Holt's prime invention, the "Caterpillar," solved the traction problem for war and peace. Ground bearing pressure per square inch less than that of your foot. Holt's war-tested motor delivers unflinching power to tracks that cannot slip.

USERS' SERVICE—Built on war experience. Holt's world-wide service assures continuous tractor performance to satisfied users.

PATENTED DESIGN—Protected by more than 125 patents—makes "Caterpillar" quality as exclusive as the name "Caterpillar." There is only one "Caterpillar" Tractor—Holt builds it.

WAR AND PEACE RECORD—"Caterpillar" tractors were adopted exclusively for the hardest war service of America, England and France. The same unswerving dependability has for more than 12 years been applied by the "Caterpillar" on the farm or plantation, in the logger camp, at the mine, oil field, road construction, and to overland transportation.

UNLIMITED USES—A flexible railroad system that goes anywhere plus a universal power plant—both operated by one man—that's the "Caterpillar." Earns dividends wherever transportation and reliable power are needed.

Write us for our new booklet—"Caterpillar" Tractor Performance

The **HOLT**
MANUFACTURING COMPANY, Inc.
PEORIA, ILL. and STOCKTON, CALIF.

New York, N. Y.

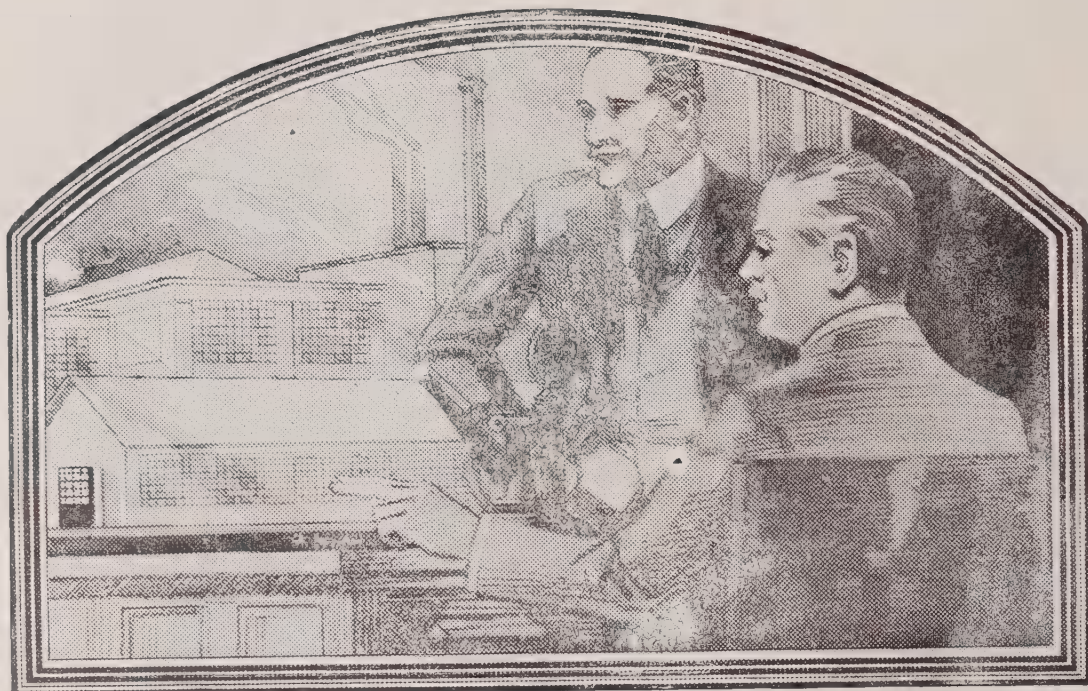
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CATERPILLAR
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HOLT Builds It



A Great American Recently Said:

"Now more than ever there is urgent need of liberal investment in soundly organized American manufacturing enterprises. In my opinion, the greatest opportunity along these lines exists in the automobile industry, for its wonderful possibilities are still in their infancy."

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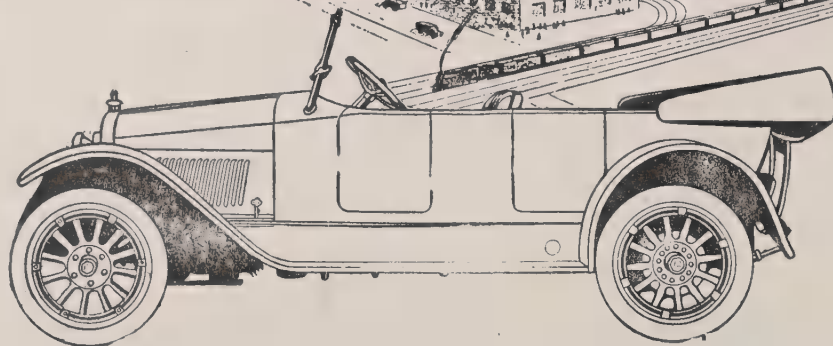
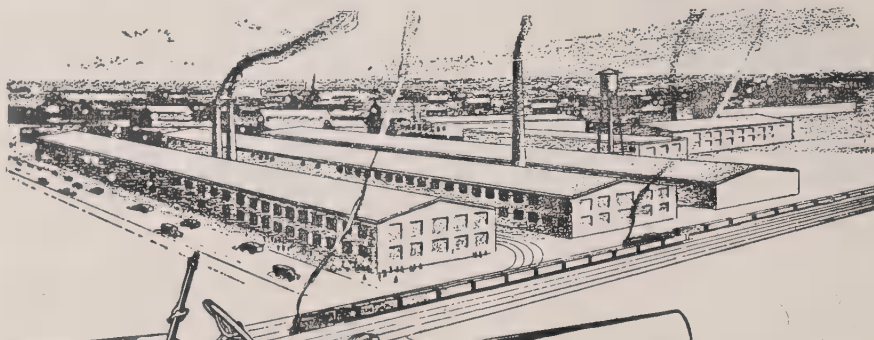
(A North Carolina Corporation)

8% Cumulative Participating Preferred Stock

250,000 SHARES

Par Value \$5 Per Share, Dividends Payable Semi-Annually

*The
Factory*



*The
Car*

An Unusual Opportunity

To Become Associated With the Founders of
This Great Southern Enterprise Which Will
Start Production On a Big Scale On April 1st.

Here is a sound opportunity for investing in an automobile manufacturing enterprise of unusual possibilities. When it begins operations, the AMERICAN-SOUTHERN MOTORS CORPORATION will be Dixie's greatest automobile plant. Its output for the first year will be 2,400 cars and this number will be increased to 5,000 the second year of operation.

The large plant at Greensboro, N. C., will begin production in April of this year and from that time the output of this factory will be distributed exclusively in Southern territory. The entire 2,400 AMERICAN Balanced SIX cars manufactured the first year have already been contracted for.

A careful study of the prospectus and literature pertaining to this issue of stock will reveal a degree of security and, at the same time, earning possibilities offered in few stock issues of recent years. The plan of floating it was designed to appeal especially to the small investor who, first, must be assured of the safety of his principal, and who, second, also desires a return from it that will be sure and generous.

The AMERICAN-SOUTHERN MOTORS CORPORATION has been formed to assemble the well-known AMERICAN Balanced SIX motor car (on the market for the past four years) for distribution exclusively in the twelve principal Southern States. It was organized along conservative lines which cannot fail to appeal to the far-sighted investor.

The AMERICAN Balanced SIX has won for itself an enviable reputation for comfortable riding and economical operation. During the years it has been on the market it has established itself firmly in the "light six" field by its unique balanced construction, its consistently high quality and attractive beauty. It is for the manufacture of this car that the proceeds of this stock issue will be used.

This is the company's first and probably its only offering of stock for public subscription. The charter provides that after the regular 8% dividend has been paid on the Preferred stock, the Common can receive an amount no greater than 6% of the outstanding Preferred, after which BOTH classes of stock share equally in all dividend disbursements. Thus it will be seen that the Preferred shares the speculative features usually enjoyed entirely by the Common.

From the standpoint of earnings, bear in mind that the first year's output of the Greensboro plant has already been contracted for. Thus the great overhead item of selling expense is dispensed with, as well as all engineering, purchasing and national advertising overhead, which will be assumed by the American Motors Corporation of Plainfield, N. J.

The officers and directors of the AMERICAN-SOUTHERN MOTORS CORPORATION are men of wide experience in the automobile field, and executives of prominence in manufacturing and finance. The list includes only those who have a proven record of success in his special sphere of activity.

This stock is being offered at its par value of \$5 per share, subscriptions to be allotted in the order received. We reserve the right to withdraw this offer without notice. For further details fill out coupon or address letter to

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AMERICAN EXCHANGE NATIONAL BANK,
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Kentucky Rock Asphalt Only One of 17 Types to Survive on Test Road

In 1909 the State of Ohio put down the famous Nelson Avenue experimental road at Columbus. Seventeen types of pavement, each 400 feet long, were laid in accordance with manufacturers' specifications and under direct supervision of an expert from each material company.

Section 10 was of Kentucky Rock Asphalt on a macadam base. Concerning this section, Bulletin No. 12 of the State Highway Commission says:

"This material is Kentucky Rock Asphalt, very finely ground. It was applied on the top course of a macadam road. About one inch of the asphalt was spread over the surface of the stone and evenly distributed with hand-rakes and then thoroughly rolled with a steam roller, forcing the asphalt into the spaces between the stones. After this had been thoroughly rolled another layer of about one inch of the asphalt was spread, and this was again rolled thoroughly.

"This material was applied in warm weather, but without artificial heat. When first completed the road tracked very readily. After a few weeks of travel, however, the surface began to get firmer and in a short time became very smooth. Several months after the completion of this work it was as smooth as the best finished asphalt street, with no waves or cracks, and entirely free from dust.

"This is an interesting construction, as it provides a surface very much like sheet asphalt, and can be constructed without artificially heating the material."

In Good Condition Today.

Bulletin No. 13, issued in September, 1910, says concerning the Kentucky Rock Asphalt section:

"This section is surfaced with Kentucky Rock Asphalt, and at the present time is in as fine a condition as the best sheet asphalt pavement, and it is in better condition than when first constructed."

In 1911, Bulletin No. 15 declared that the Kentucky Rock Asphalt section was "in very fine condition, the surface closely resembling a sheet asphalt pavement."

After ten years' service and no repairs the Kentucky Rock Asphalt section of the Nelson Avenue

Experimental Road is in excellent condition today, as the accompanying photograph shows.

Furthermore, it is the only section of the road which any manufacturer would dare show as a sample of his material.

Secret of the Road.

Kentucky Rock Asphalt is a natural super-asphalt—hard silica and a live bitumen thoroughly mixed by nature in a process requiring thousands of years.

Laid cold on an ordinary macadam base, it will produce a surface second to none. It wears because of the hardness of its mineral aggregate. It does not break or crack, because the bitumen which binds it is uncooked. It does not lose its life after years of wear and exposure.

Kentucky Rock Asphalt is most economical because it is laid cold by ordinary unskilled labor and does not require any mixing or heating apparatus. Repairs due to imperfections in the foundation (the asphalt itself does not break or crack) are simple and inexpensive. The saving in maintenance will in time pay for the road.

Kentucky Rock Asphalt is the ideal surface for highways and repair has made asphalt available where heretofore the cost has been almost prohibitive.



If you are interested in good roads, write for our booklet, "The Road to Camp Knox."

You will find it a most fascinating story of Nature's own paving material.

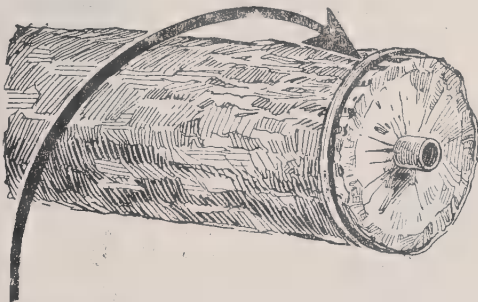
Kentucky Rock Asphalt Company, Inc.

716 Paul Jones Building
LOUISVILLE, KY.

From the Dim Past Into the Distant Future Reaches the History of Armco Iron



Ancient Moorish nails of pure iron from a doorway in Spain. Although undoubtedly made before the discovery of America (1492), these nails are in almost perfect condition after more than **FOUR CENTURIES** of service. Analysis shows extremely low contents of carbon, manganese, copper and sulphur.



NINETY-SIX years in the ground and unharmed by rust. In 1823 the City of Cincinnati laid water mains made of oak logs with the centers bored out. To prevent the logs from checking, hand-made iron bands were placed tightly around their ends like the hoops on a barrel. Now after more than ninety years, these are being dug out. The bands are still in good condition because they were made out of iron that was practically pure.



This six-foot culvert of ARMCO IRON shows no sign of its 12 years' service. Future generations will reap the benefit of the wisdom of the men who used Armco instead of something cheaper.

THE TRIANGLE MEANS SOMETHING TO YOU
We are willing to back the Triangle with a gold bond.



RESISTS RUST

Jacksonville, Florida

Armco Culverts for Permanent Roads

The Dixie Culvert & Metal Co.

ATLANTA, GEORGIA



Little Rock, Arkansas

MAKES THE CONCRETE TOUGHER—

AGASCO ROAD OIL

Seal-Coat for Concrete Paving

Spread over the surface of the concrete as road is completed, AGASCO Road Oil prevents it from drying too rapidly — Acts as seal of the moisture until concrete has set thoroughly.

AGASCO ROAD BINDER

for smooth, resilient, dustless roads—
Holds the mass together.

AGASCO PAVING PITCH

filler and cushion for granite cube, wood-block or brick pavements—Does not crack, crumble or shrink.

AGASCO Preservative Paints: Number Nineteen (for metal) and Number Fifteen (for wood) protect bridges against the elements.

ATLANTA GASLIGHT CO.

ROOM 232, 14 FAIRLIE STREET, ATLANTA, GA.

The BEST CULVERT For Good Roads

*We sell direct
at Wholesale
Prices*



Used by practically all the cities, counties & townships in the State

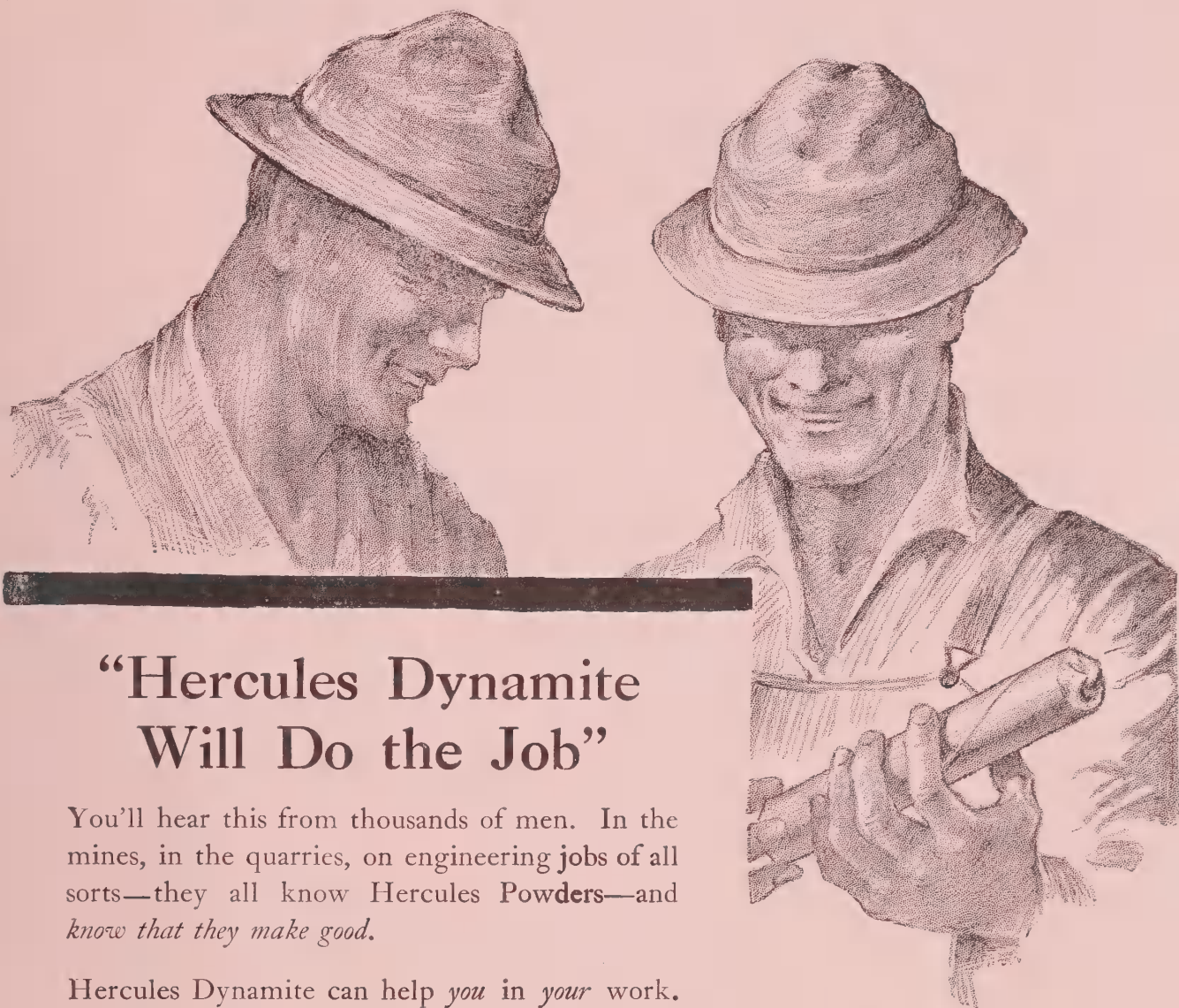
The Point ————— COST LESS AND LASTS LONGER

Our Vitrified Shale Rock Culvert Pipe will last 50 years—and longer.

All Culverts furnished by us will be replaced free at any time which give away, disintegrate or rust, or otherwise fail when the same have been properly installed according to the usual and accepted manner for installing same.

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Annual Capacity, 2500 Car Loads



“Hercules Dynamite Will Do the Job”

You'll hear this from thousands of men. In the mines, in the quarries, on engineering jobs of all sorts—they all know Hercules Powders—and *know that they make good.*

Hercules Dynamite can help *you* in *your* work. No matter whether you are mining copper ore, getting out road ballast, digging an aqueduct or grading a highway, one or another of the many formulas or grades of Hercules Powders will fit your needs. *These powders will speed up work and cut costs.* They have done it for others and will do it for you.

If you think we can help you with any of your blasting problems, write us. Our service staff is always ready to give you any information that will help you in your work.

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Speaking of **CONCRETE ROADS STREETS and ALLEYS**

53,000,000 Square Yards
Were Placed Under
Contract During 1919—

Over twice that of any previous year.
Every state—your state—contributed to
this total. Public preference is expressed
in this record. Watch 1920!

Concrete highways defy the poundings
of traffic year in and year out. They
won't blow away during dry weather,
won't wash away in wet weather. Let
weather and season change—the road
won't—for any day, any season is just
the same to a concrete road. It's not
what they cost to build but the little
they cost to maintain that makes con-
crete pavements economical.

People know what they want and ask
for it—**concrete**—a dollar of value for
every dollar that they are so generously
investing in improved highways.

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North Carolina Good Roads Association—
Annual Convention, Asheville, June 16-18, 1920

SOUTHERN GOOD ROADS

A MONTHLY MAGAZINE
DEVOTED TO HIGHWAY
& STREET IMPROVEMENT

Vol. XXI. No. 4

Lexington, N. C., April, 1920

10c. a Copy



Published by
Southern Good Roads Publishing Co.
Lexington North Carolina

Atlas Explosives



are preferred by many road builders for

- Clearing right of way
- Removing stumps, boulders and ledges of rock
- Breaking up hardpan and shale for easy handling
- Making side hill cuts
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Those interested in any phase of road construction work are cordially invited to avail themselves of the assistance of our Service Division. Men with many years of experience in the use of explosives in road making will co-operate with you fully and freely.

Use of the right kind of explosives in the right way will reduce costs, and it is the business of ATLAS Service Men to see that costs are kept at the minimum. Put your blasting problems up to us.

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SOUTHERN GOOD ROADS

Published Monthly
By Southern Good Roads Publishing Co.

Lexington, N. C., April 1920

Entered at Lexington Post Offices
second class matter

N. C. Good Roads Convention June 16-18

By MISS H. M. BERRY, Acting Secretary

The North Carolina Good Roads Association will hold its annual convention June 16, 17 and 18 at Asheville. This will probably be the largest and most important meeting to be held in the State this year. During the past six months the association has grown rapidly in numbers and in the scope of its influence, there being now between 2,500 and 3,000 members in sixty-two counties.

The association is strictly non-political and non-sectional. We indorse no particular road or roads. It is our intention to wage a campaign for the development of a State-wide system of hard surfaced roads, in which each and every county shall share. It is believed that only by advocating such a system and regarding the proposition as one of State-wide importance that a final and adequate result can be achieved. The association is not indifferent to the splendid efforts which have been put forth by individuals and groups of individuals in various sections of the State for the promotion of certain roads which are, from a geographical standpoint, of particular interest to them, and we ask the hearty co-operation of these persons in the program which is being advocated by the State Good Roads Association, with the idea that all such roads should become a part of the State-wide system for the general upbuilding and welfare of the entire State.

The State of North Carolina at the present time has approximately 52,000 miles of public road. Of this mileage, about 5,000 should be included at the present time in a State system, and constructed of such materials as will adequately meet the present and future traffic burdens of at least our generation. The greater portion, if not all, of this 5,000 miles should be of hardsurfaced construction. This 5,000 miles, or 10% of the total mileage, would carry approximately 80% of the traffic of the entire State. This would leave 47,000 miles of county highways for the counties to construct as feeders to the State Highway System. As population increases and the needs of the people grow, the mileage of State highways should be increased. It is believed that the contemplated State system could be constructed during a period of from ten to fifteen years and that adequate provision should be made for financing

such a program partly through taxes and partly through bonds; the latter to be issued serially and as needed.

The saving to the average citizen of North Carolina through the construction of these roads would offset his taxes many times. We now have invested in North Carolina over \$100,000,000 in automobiles and motor trucks. This investment is being added to at the rate of \$100,000 a day every day in the week, including Sundays; or over \$36,500,000 a year. The life of this type of investment would be prolonged five times at least through the construction of such a system of roads.

Experiments have shown that it takes three times as much gasoline to carry a 2-ton truck over a mile of earth road as it does over a hard surfaced road, such as concrete or asphalt. It takes twice as much gasoline to go over a good gravel road as it does over a hard surfaced type. Therefore, our gasoline bill would be reduced at least half, if not three times, by the acquiring of this State system.

The life of the automobile tire is prolonged five to ten times by a hard surfaced road as compared with the softer types.

The farmer would be able to market his products in a shorter time (thus saving labor); and to take advantage of various markets by having hard surfaced main highways.

The potential business of every merchant, banker, or other business man, whether in the country or in the cities and towns, would be greatly enhanced by better transportation facilities for the country people.

The State would become more attractive to desirable settlers who demand favorable living conditions along with fertile lands. To be able to advertise a State system of well built and well maintained highways it would be most effective in bringing to the attention of outsiders the desirability of North Carolina as a place of residence and to put home dwellers on our vast acreage of unused lands.

North Carolina is more prosperous than ever before in her history. The output of her agricultural products places her fourth from the top of all the States of the Nation. A third of her last year's

tobacco crop would pay for the proposed State system. Her manufacturing interests have brought her well within sight of the top. A third of her wood products would build the State system. The people generally have more money and are spending more money for things that vanish with the spending than ever before in any generation.

If we are to build our house upon the rocks of an established prosperity, we must begin to lay the foundation stones in an investment in those things which make for solid and substantial growth; and among these an adequate transportation system is the corner stone.

\$55,000,000 FOR THE SOUTH.

(By George W. Combs.)

Washington, Feb. 12.—That the South has come to the front in the matter of road building and realizes the advantage of good roads, as stated by the United States Department of Agriculture, is shown by the following facts:

Good road projects on which construction has begun in the Southern States under co-operative agreement between the federal and state governments will cost a total of \$23,393,827, according to estimates of the department. This cost is divided on the average basis of 40 per cent paid by the federal government and 60 per cent by the states concerned. The projects involved have a total length of 2,671 miles. Numerous other projects have been agreed upon between the federal and state governments, but the execution has not yet been undertaken.

These figures, which are official, include allotments from the federal appropriations for the fiscal years 1918 and 1919, part of which ran over into the fiscal year ending June 30, 1920, by reason of the war and other causes, and also allotments from the federal aid funds available during the first quarter, of the current fiscal year.

The projects for Virginia which have been approved call for a total of 149 miles of road at a total estimated cost of \$1,892,497. Nine projects have been approved for the Old Dominion state in one month.

In round numbers \$55,000,000 has been apportioned by the Secretary of Agriculture for federal aid in good roads construction in Southern States out of the funds available for the fiscal years 1919 and 1920.

This sum has been divided among the states as follows:

Virginia, \$3,175,620; Alabama, \$3,359,221; Arkansas, \$2,686,682; Delaware, \$264,424; Florida, \$1,831,736; Georgia, \$4,307,437; Kentucky, \$3,125,892; Louisiana, \$2,177,868; Maryland, \$1,491,607; Mississippi, \$2,877,266; Missouri, \$5,435,013; North Carolina, \$3,648,489; Oklahoma, \$3,690,349; South Carolina, \$2,925,174; Tennessee, \$3,623,762; Texas, \$9,363,021; West Virginia, \$1,701,538.

Not only are Southern States putting up 60 per cent to the federal government's 40 per cent for joint highway construction, but large sums are also being expended in the South by state, county, and local committees for good road work. The total of such

sums is estimated to be at least \$100,000,000 for this year.

The government has not taken a census of road construction since 1914, when the revenue in Southern States applied to roads and bridges aggregated over \$52,000,000. The total road mileage in Southern States was 814,565, of which 73,594 miles was surfaced. The road census to be taken this year will show big gains in surfaced road mileage in the South, it is expected.

While affording means of transportation and other utilization purposes the good roads of the South are to be beautified. One of the latest suggestions along this line has been adopted by patriotic citizens of Tampa, Florida, namely, to line the 15 miles of highways up the west coast of Florida with trees and shrubs planted as a memorial to the Tampa and South Florida boys who lost their lives during the war.

A similar suggestion has been made by Charles Lathrop Pack, president of the American Forestry Association, who advocates "roads of remembrance" as memorials to America's world war heroes in Georgia and other states.

Goodyear Establishes Good Roads Bureau.

To stimulate the interest of both public and states in the value of better roads, The Goodyear Tire & Rubber Company has created a new department to be devoted entirely to this work. It is in charge of Mr. C. M. Wood, who is well qualified for the work. This department will gather data on the cost of good roads, methods of taxation, and other valuable information necessary before legislatures can frame and pass good roads legislation.

So great is the interest of Mr. F. A. Seiberling, president of the company and former head of the Lincoln Highway Association, that the new Good Roads Bureau will have the aid of all Goodyear salesmen and much educational literature to help create public sentiment toward improvement of all roads in the United States.

Missouri Receives Trucks.

That considerable improvement work is to be done on the highways of Missouri this year is evidenced by the receipt of 104 government 3-ton trucks for that purpose. The trucks will be allotted, it was explained, only to counties and road districts where improved highways are to be constructed, and upon endorsement of both State and Federal authorities. Twenty of the trucks already have been assigned.

Governor Chas. H. Brough, of Arkansas, will succeed the late Senator Bankhead as president of the United States Good Roads Association.

The Stewart County, Tennessee, Road Commission, under whose direction the funds received from the issue of \$200,000 worth of road improvements bonds will be expended, has perfected organization by electing Mr. Ed. Walter, of Dover, chairman, and employing Messrs. G. W. Williams and O. E. H. Smith as secretaries.

Highway Educational Work Extending In United States

The extent to which the people of the United States are committing themselves to a definite policy of highway development is shown by reports reaching the Federal Highway Council from all sections of the country, and the Council discusses the situation in the following language:

In the face of high cost for both materials and labor, and the fact that in some states construction programs must be altered somewhat to meet existing labor and material conditions, there is no tendency upon the part of the people to slow down in their plans to place the nation's highways upon a higher plane in the country's transportation system. Tersely stated, "they are sold to the heels" on the proposition to construct highways that will release rather than restrict traffic, and they are dismissing labor and material problems with curt instructions to their official servants that it is up to them to deliver the roads.

A curious fact in connection with construction problems at the present moment, is that the building of roads is seriously hindered by the same evil which they are designed to remove—lack of transportation. According to authoritative information, production is halted to a greater degree by inadequate transportation facilities than by labor shortage. At least this is true, it is claimed, in the production of materials for road building.

Highway officials—state and county, as well as national—are facing their duties with patience and tact, and out of a maze of trying situations, construction is going ahead at a fairly satisfactory rate. But as Paul D. Sargent, state highway engineer of Maine, and president of the American Association of Highway Officials, pointed out in a meeting at Philadelphia recently, when the people finally decide to authorize the development of any particular road project, they are prone to expect the work done almost over night.

Another feature in connection with road building at this time is the fact that more and more the educational part of highway development is extending its scope, while at the same time its primal source of activities is being concentrated into a central and more central organization, directed from the standpoint of the public which represents the builder, the user, and the tax payer. The direction of highway educational work along broad lines, is the result, according to the view taken by many of the highway officials, of the public's determination to get roads built upon a comprehensive scale, economically and with the type best suited to each locality and adapted to traffic needs.

As the national body around which highway educational activities are now being centralized, the Federal Highway Council occupies an unique position in building for better transportation. It has a direct affiliation with more than eleven hundred organizations throughout the entire country representing the public welfare and commercial interests of millions in population. From those organizations,

as their representatives, fifteen thousand nominations have already been received for membership in the Council.

Owing to the rapidly growing use of the public highway as a passenger and freight carrier—both in short and long hauls, and the lack of a corresponding progress in the efficiency of the road itself, economic problems have arisen that call for a careful and a clear presentation of facts to the public. As a result of the divergence between the service highways are called upon to render, and their ability to render that service, the highway from an educational standpoint, has become a subject of much greater importance than heretofore, so that highway officials—national, state, and county—are placing greater reliance upon the educational phase of highway work in securing effective and practical co-operation from the public.

Build Good Roads If Any.

Using as a text, "The foolish man built his roads on the sand. The floods came and washed them away," the Palatka News preaches a sermon about poorly constructed roads in Florida that should be dinned in the ears of every Florida tax payer until there is no longer any short-sighted opposition to road bonds of sufficient scope to build permanent highways. As the Palatka paper points out, the roads destroyed by the rain in St. Johns and Brevard counties were merely sand trails with nine-foot brick paving laid on the sand. They had never been good roads and should be replaced with paving that will serve for many years.—Orlando, Florida, Sentinel.

Another Paterson Product.

A machine for sharpening well drills has just been finished and shipped from the Wood Drill Works, Dale Avenue, Paterson, N. J. Heretofore it has been customary for well drills to be sharpened by ordinary blacksmithing methods, that means finishing with a sledge-hammer taking hours to sharpen a drill that is dull. This machine will sharpen a drill in about 5 minutes, makes a cleaner, neater, and truer job than can be hoped to be made by the use of sledge-hammers. It is simply an adaptation to a 5-inch rock drill with certain modifications to the new purpose.

This machine will be used near the Bethlehem Steel Works, and as this machine is intended to revolutionize the well drill sharpening business; as everyone who is drilling for oil can speed up their work a great deal by the use of this machine. And, as drilling for oil is almost a mania in the oil fields; this will certainly add its mite to the quick production of oil.

The State Highway Department has taken hold of the project to construct a bridge over the Osage river in Missouri about four miles above the confluence of the stream with the Missouri.

Administration of the Roads

By GEORGE A. BILES

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HIGHWAY administration is an exhaustive subject. So this paper will treat only in a general way such phases as apply to the organization and management of departments on the scale of states' activities. For the most part, this work is in charge of commissions appointed by the governors, who select their assistants, or a single commissioner, selected by the governor, with his deputies, chief engineer and other assistants.

Three contributing factors to this end are control, confidence and courage: Control, by centralized executive authority; confidence, executing our plans with intelligence, fairness and dispatch; courage to disburse vast sums of public money—to do the right thing in spite of the selfish aims and importunities of individuals or communities. Time will vindicate a work well done.

A basic principle in creating an organization is to obtain men always responsive to the demands of the situation and who will work as a team for the realization of the executive's aims and purposes. Recognition for meritorious service must be given such men. This is only possible when salaries are not fixed by statute, for an employe should have fair compensation and an incentive to put forth his best efforts.

In developing an organization combining technical and business functions, statutes should be passed empowering the state organization to supervise expenditures and operations, and extend engineering and advisory assistance to the counties, townships or towns. The highly trained engineering force and the state organization should be at the disposal of the county to avoid those abortions which result where innumerable engineers are permitted to operate promiscuously. Work should be done under standard specifications and competent inspection. The inspector is the most important individual on the work, upon him depends the success or failure of the engineer's plans. The inspection force should be intelligent and practical men, who hold allegiance to no one save their superiors, and they should be paid commensurate wages. Where communities appropriate large sums or issue bonds, they welcome state co-operation; it creates a sense of security and in good-roads campaigns this protection has been the biggest contributing factor to their success.

Through such co-operation the comprehensive idea of state systems of main primary roads can be extended to the counties on secondary systems or roads of local importance which tie into the main system, with the ultimate satisfaction of seeing roads built to meet the demands of traffic and creating a network of good highways. Build roads that with reasonable maintenance will be there at the maturity of your bonds; build for the future, capitalizing high maintenance cost and putting this in the road.

Attract contracting concerns with ample capital and equipment to insure completion of your program. The effect would be disastrous if contracts were awarded in large numbers without further investigation than to satisfy ourselves that the contractor could furnish a

bond. Tearing up roads and listlessly dragging work along because of financial or other reasons is more than any organization could survive. Before work is awarded, the contractor's responsibility should be established. This data should also be accompanied by records of his previous performance.

Psychology can be applied to this proposition to good advantage. Starting out with the human equation, if you can convince men of your fairness and sincerity, the great majority will be receptive to the suggestion that they must derive some compensation out of satisfaction in doing good work. Upon award of contract, the contractor automatically becomes as much a part of the organization as any employe, the only difference being that he is paid in units of work while the employe is paid in salary.

As a factor of safety, we should seek the passage of laws giving ample power to the organization to prosecute a program, permitting the acquisition of property and construction of buildings necessary for manufacturing any road material entering into the building of a modern highway, which materials may, in the discretion of the department, be furnished contractors on state work.

In highway work the greatest single requirement is organization and system. We all have been zealous in advocating large appropriations and money has been thrust upon us with a free hand. Now we are bid to perform. There is infinitely more to it than assembling many engineers and draftsmen to prepare surveys and plans. A contractor once said to us: "Building roads on paper is not putting them on the ground." There should be a blending of business and of technical thought as the basis of action.

Here is brief description of the organization of the major divisions of a modern highway department.

This division consists of the commissioners and their secretaries, or a single commissioner with assistant and secretary. Its functions should contemplate the determination of all policies and never be required to consider the operating details of any department division. The closest supervision should be exercised over the organization. Conferences with division officials should be called at intervals, when functioning of systems of operation may be fully covered. The executive division should be supported by an organization equipped to do the necessary planning and enforcement of policies, each policy being discussed with the divisions affected and, after adoption, followed to successful conclusion. The executive division should have correct and comprehensive information of the activities of every branch which can be obtained only through systematic study of the results, and provision made for co-ordinating the department activities toward eliminating friction and duplication.

This division should supervise the principles of management of all branches; the most modern principles are necessary for its successful operation.

To determine the basic requirements it is necessary, first, that a complete analysis of the regulating

statutes be made and that the duties be shaped along distinctive lines.

In presenting the executive division's policies to the various branches the management division must keep informed of the policies outlined to determine the methods to be followed in carrying them out. In many cases the action taken will affect more than one branch, making it necessary that each be advised of the specific duties assigned to it for development. Uniform instruction of employes at division conferences and propagation of loyalty and co-operation can be effected best through this agency.

To schedule the performance of all phases of the department's work and disseminate them graphically and uniformly; to follow up the schedules presented and investigate all complaints and delays. Developing a policy or executing any phase of the department's work—particularly in those cases where more than one division is involved—demands that the duties of each branch be so scheduled that the various elements may be completed at such a time that its progress may be uniform. To this end, a careful scheduling of operations and its presentation to the divisions affected must be made. It is not sufficient to merely present a schedule and expect satisfactory results to follow. Frequently important policies will fail when some phase of development has not been followed up to determine that it is properly progressing.

Absence of central control will always result in an unbalanced organization; therefore, there must be a common meeting-ground through which the results achieved by any one branch may be disseminated and made available for all branches. The fruits of any special work must be recorded and transmitted to all branches. The logical sequence to the creation of an organization upon a functional basis is that each function be thoroughly analyzed and standard methods of procedure prepared for individual and collective use. This standardization will result in a uniform and high-grade product as the organization in time will be composed of specialists in each branch activity.

In the development of public confidence, information should be given out through bulletins, periodicals, press notices, etc., of the status of work, difficulties encountered, and the success being attained. In addition, comprehensive statements, reports and graphic charts should be prepared for the executive body. Careful consideration should be given to this phase on account of the large field of activity to be covered and for the effect which such publicity will have upon the organization at large.

Comparable with the idea of control of development of future operations, it is necessary that a rigid control of the existing systems and methods of procedure in all branches be had. There should be no change made without all the branches affected being given an opportunity to state how the suggested change would affect their work. Uniform, well-appointed office facilities and modern equipment and supplies are a necessity. Big projects must be handled in a big way, and it is poor economy to treat this phase in any different way than that of the actual construction or maintenance of the road where every effort is made to secure the best.

Provision must be made for complete records of the department personnel; to supervise the work of all subdivisions involving other subdivisions, and whose work is general in its nature, such as purchasing, con-

tract, equipment, information, stenographic, typing and duplicating, and filing and mailing. In many organizations there is considerable turnover and undetermined loss suffered because the personnel problems are not considered. Employes should be placed where they can render the best service. Personal differences, if they extend beyond the limits of the respective branches, should be analyzed through this agency and adjustments made through a tactful discussion of the points involved.

Other responsibilities include the compilation of records of the authorization of all work upon which the department funds are expended. Such authorizations must indicate the specific kind, location and extent of the proposed work and the amount reserved to cover it.

Complete knowledge of activities is essential before the direction of operations can be intelligently taken up. Therefore, the preparation of statistics must be handled through that branch which comes in closest contact with all branches.

Purchasing Bureau.—The large expenditures for supplies and material required demand a highly specialized purchasing organization. The location of materials, grade of supplies, quantities available, shipping conditions, traffic regulations, local conditions affecting prices and storage facilities, are some of the questions involved.

Contract Bureau.—In a construction or maintenance program to spend considerable money, especial attention should be given to preparing contracts and agreements, therefore a contract branch should be established and supervised by a competent assistant, preferably one with some legal knowledge.

Equipment Bureau.—To guarantee the best results an organization of mechanics and inspectors, under a competent mechanical engineer, should be created commensurate with the amount of equipment and the work. This will provide systematic inspection with uniform instruction to operators and standard, workmenlike repairs.

Information Bureau.—Information should be disseminated by a special bureau to establish the best relations with the agencies involved as well as a uniform official presentation of all public information.

Stenographic, Typing and Duplicating Bureau.—Grouping all stenographic work in one bureau is desirable for uniformity and equalization of work; this is particularly valuable in case of an emergency in any single branch, that the necessary force may be concentrated upon special work when required. Proper use of duplicating equipment—duplicating, mimeographing and multigraphing machines, directed from one point—is a big feature in handling voluminous written matter upon which quick service is imperative.

Filing and Mailing Bureau.—Both in the field and the headquarters offices it is important that uniform filing methods be adopted; by establishing uniform procedure in the division offices confusion is avoided if it becomes necessary to change the personnel. Standard reference symbols and divisions of filing make this procedure comparatively simple. The single-unit system of handling incoming and collecting and distributing outgoing mail expedites the work and has a tendency to reduce postage expenditure. As to this bureau adequate interdepartmental messenger service should be established.

This division is composed of a chief engineer, principal assistant engineer, testing engineer, constructing

engineers, district engineers or field men, and assistants. This division is concerned entirely with road construction and bridges and their engineering problems. The necessity for complete control is emphasized by the number and magnitude of the projects under way. The functions of this division are susceptible of grouping upon practically the same basis as the department as a whole and the division of responsibility must be in accord with such grouping as designated as engineering, draughting and testing.

Engineering Section.—This branch, through its field offices, should handle the surveys for all road and bridge construction work and those for change of alignment or other special work. If the statutory requirements are such that assistance in making surveys is offered the townships, this work should be directed by the engineering branch, and so should be preparing and revising specifications. Systematic supervision and inspection is the final test of engineering efficiency.

Draughting Section.—This branch prepares the work. Where justified, this division should do its blueprinting, thus controlling all its functions. Recording property releases is also part of the work, together with preparing preliminary estimates and checking current, monthly and fine estimates on contracts.

Testing Section.—Where the work justifies, a first-class testing laboratory is an asset. Aside from checking and testing materials this branch can do investigation and research work to establish other sources of material supply where accessible material is scarce and costly. The test results form an excellent guide for the purchasing bureau.

This functional grouping applies to the headquarters organization, each district office handling its engineering and supervisory work, covering its construction and maintenance.

The division is in charge of a maintenance engineer with his inspectors, engineers, office assistants and county superintendents. This is one of the most important divisions of the organizations for it is vital that the investment be protected through adequate maintenance. On account of the number of employees engaged and the units involved, a high-grade system of operation is necessary. Thorough instruction is essential, and regular inspection must be made and advice given upon the standard methods necessary under the conditions encountered.

Maintenance work may be classified as general repairs, surface treatment, resurfacing and snow removal, and the maintenance division should determine and enforce standard methods for handling each class.

At the close of each year detailed estimates for all work for the ensuing year should be prepared and authorizations issued for funds set aside as early as possible.

The duties incident to a large maintenance program are important and varied—selection of materials and supplies, shipping and delivery, securing and distributing equipment, with its operation and maintenance, and the labor employment and payment.

This division is in charge of a commissioner, with an engineering assistant, office force and a field force of township engineers acting in an advisory capacity.

This division's ultimate success will be mainly due to educational work, particularly in those units of authority engaged in constructing or developing local road systems. This division is of unquestioned value in the service which can be rendered by engineering

advice and supervisory control of building and upkeep, and instructing officials in standard methods of performance.

This division approves contracts for spending township funds and has responsibilities in enforcing legislation applicable to townships and the distribution of reward funds. Because of the division's general scope, the responsibility of issuing permits to public service companies or individuals for placing substructures in highways or poles and temporary crossings thereon is placed under its charge.

Automobile registration is in charge of a registrar, with his assistant, cashier and office force, and field inspectors for enforcing legislation regulating motor-vehicle operations. The functions may be grouped as follows:

Receiving Section.—This section classifies incoming mail, examines applications for sufficiency of fee, numbers applications, audits accounts and deposits receipts, and keeps necessary records. When receipts approximate \$150,000 in a single day, the need for conducting this work on high-class banking principles is self-evident.

Registration Section.—This section will be the largest single branch on account of the great amount of typing and proofreading required; this work must be well organized or congestion will result. Considerable saving will result by adopting methods which will furnish necessary records from the original writing. Duplicating processes and specially designed ledger sheets and file cards will produce a uniformity of records which are indispensable.

Filing Section.—This section files the applications and cards and prompt response must be given inquiries regardless of the form in which they have been received. Increase in the number of stolen vehicles requires that every means be adopted to assist in their recovery and the apprehension of the thieves. Files arranged alphabetically according to registrant and numerically according to manufacturers and engine numbers, are also of material assistance.

Shipping and Mailing Section.—Shipping license tags and mailing registration cards assume the proportions of the shipping and mailing of a large mail-order establishment, and mechanical means of sealing and stamping envelopes and handling tags are a necessity. The inspection of tags during their manufacture should be handled through this branch as well as packing and sealing.

Inspection Section.—Legislative action has been toward a more rigid enforcement of rules and regulations designed for public protection—an extremely important responsibility. An inspection force distributed throughout the State and principally at the centers of population, with a chief inspector at headquarters, will be very effective in breaking up many violations. All questions as to revocation of licenses and recovery of stolen cars should be handled through this branch. Publication of lists of stolen cars and the maintaining of files in connection therewith are also features of this work. Lists also should be prepared and published showing all registrants at regular intervals.

This division is in charge of a comptroller, who looks after the financing and accounting, assisted by a specialized office force and paymasters.

In the majority of cases highway funds are so secured that the work of financing is confined largely

to the budgeting and auditing of accounts and cost accounting. The amount of work under contract and that done by the department forces will determine the volume of work handled. The work on contracts consists in checking current and final estimates against budget funds, and drawing certificates therefor to present to the fiscal officers for payment. Upon work handled by the department accounts are received in three forms, payrolls, invoices and expense accounts.

Payroll Section.—The payroll section handles the payment of labor—individual payments, issuing checks, investigating irregularities in the field and verifying costs distribution covered by the payrolls, as well as preparing vouchers to secure advances and reimbursement from the fiscal officers.

Invoices and Expense Account Section.—This section has charge of the auditing of all invoices submitted for payment, applicable to purchase orders issued by the purchasing bureau; coding and verifying the distribution charge, and issuing voucher checks and preparing vouchers. Vendors' records are kept in this branch also. Checking and coding expense accounts in a large organization should be handled in this section.

Bookkeeping Section.—Mechanical bookkeeping methods showing perpetual balances upon each authorization of work issued, should be used. This method permits the accumulation of statements showing the status of funds or allotments for specific kinds of work at any time. The entry of estimates is also handled in this section, together with certifications to townships, boroughs and counties, as are all dealings with the State fiscal officers.

Cost Accounting Section.—This section is one of the most important branches of a highway organization, for without costs no intelligent conclusions can be secured. Mechanical means of classifying and computing costs upon each process or operation, and the furnishing of each branch involved with copies of cost reports covering their work, affords reliable means of disseminating this information and is an incentive for efficiency.

The divisions mentioned will in the majority of cases be applicable to most highway organizations, and additional units may be created as the need arises, always keeping in mind the logical grouping of fractions and the establishment of the same principles of control.

In conclusion, effective highway administration resolves itself into a broad and rigid central control form which will emanate all administrative policies and an efficient organization for interpreting, presenting, and developing such policies. Above all, the human relations in the organization must be given most careful consideration, without which well-laid plans and well-designed organizations and systems lose their effectiveness and the desired measure of success is not attained.

\$25,000,000 Suggested for South Carolina Highways

The flotation of a \$25,000,000 bond issue and the levying of a two-mill property tax for the construction of a State system of hard surfaced highways and the building of a county system of permanent lateral roads, are advocated in a statement to the South Carolina Landowners' Association by R. Goodwyn Rhett, of Charleston, says a recent Columbia dispatch.

"Mr. Rhett is taking the position of all broad-vis-

ioned men in South Carolina," said George R. Wheeler, manager of the South Carolina Landowners' Association. "The very life of the State depends on think we will get good roads this session. In fact, I am of the opinion, that there is no member of either house of the legislature opposed to good roads; they have been unable to get together on methods. I am satisfied that the various ideas will be ironed out this year and the friends of a correct highway system will get together on common grounds.

"In my judgment," said Mr. Rhett, in his statement, "we have come to that point in the good roads movement where we are either going forward or backward.

"The motor vehicle is going to revolutionize transportation and travel all over the world, even more than it has already done, and I am inclined to think even more than the railway did many years ago, but the motor vehicle needs a certain kind of roadway just as the locomotive needs its steel rails. The fact that it can get along on any kind of road with one-third, or one-fourth, or one-fifth of its efficiency is blinding us to what it really can do, is doing, and is going to do whenever the proper roadway is constructed for it."

Georgia Highway Engineers Appointed

Announcement has been made by the Georgia State Highway Board of the appointment of district engineers for each of the twelve congressional districts of Georgia, together with the names of the cities which they will make their headquarters.

The names and assignments of the division engineers follow:

First Division—Major B. H. Graff; headquarters, Savannah.

Second Division—Frank Mitchell; headquarters, Thomasville.

Third Division—Captain W. A. Caye, Jr.; headquarters, Americus.

Fourth Division—H. G. Smith; headquarters, LaGrange.

Fifth Division—J. W. Hawkins; headquarters, Atlanta.

Sixth Division—E. H. Davis, acting engineer; headquarters, Griffin.

Seventh Division—A. A. Simonton; headquarters,

Eighth Division—R. T. Goodwin; headquarters, Rome.

Athens.

Ninth Division—H. W. Morgan; headquarters, Gainesville. Mr. Morgan will have an assistant division engineer, H. F. Whitner, with headquarters at Blue Ridge.

Tenth Division—William Greenslade, acting engineer; headquarters, Augusta.

Eleventh Division—A. W. McWhorter; headquarters, Waycross.

Twelfth Division—Appointee has not yet notified his acceptance; headquarters, Dublin.

From Greenville, Pitt county, North Carolina, comes the news that fifteen miles of highway paving has been let to T. H. Gill and Company, Binghamton, New York. The paving brick for the road surface has been purchased by county officials who will supply the paving brick to the contractor.

Need For National Highway System

By H. G. SHIREY, Secretary Federal Highway Council, of Washington, D. C.

PRIOR to the great development of the railroads there was a necessity for certain national highways to take care of interstate traffic, and especially was this demonstrated by the establishment of a national road, over which the products of the middle Mississippi Valley States could be transported eastward.

This necessity became so great that it led up to the projection of a national highway from St. Louis to Cumberland. This road was constructed through Maryland, Pennsylvania and Ohio, graded through Indiana, and surveyed through to St. Louis. At Cumberland it tapped the Chesapeake and Ohio Canal, and this waterway was used to transport freight from Cumberland to Georgetown, where it reached the navigable waters of the Potomac, and was distributed from there and Alexandria.

The people of Maryland, realizing the great advantage this would give to Georgetown and Alexandria, immediately set out to provide a means for securing a portion of this traffic and constructed a State road from Baltimore to Cumberland, connecting with the National Road at that point. This gave access over a highway to Baltimore in competition with the water route to Georgetown.

In the early days of the nineteenth century these roads served a great good and much benefit came to the people of Maryland through their construction. A large percentage of the traffic coming over the National Highway to Cumberland continued through to Baltimore and made that city a large distributing point instead of Georgetown.

We all know the history of the old National Road as soon as the great era of railroad development took place. The unit of power over the highway in those days was the horse or ox, and the distance that could be traversed in a day was limited to the endurance of these animals, and under normal conditions did not exceed 20 miles without a change of teams. This mode of transportation was naturally slow and expensive, and therefore, when the development of the railroads came along, traffic over the national highways practically ceased, and the necessity for national roads also ceased with the abandonment of traffic.

This condition continued until the late '90's, when many of the States, realizing the great cost that was being levied constantly, due to the small load that could be transported over mud roads, took up this important problem, placing it in the hands of the Agricultural College or Agricultural Department for study and a recommendation for its probable solution. It was soon discovered that the influence of the mud road on the development of the States and counties was more far-reaching than the most vivid mind had ever imagined.

It was found that the excess cost for carrying the products from the farm to market over unimproved roads ran into many hundreds of millions of dollars annually, and therefore became imperative that this

great cost be reduced to a minimum. The States immediately took up this question of better roads and passed acts extending aid to the counties in assisting them to solve this most perplexing problem.

About this time there came into existence and fairly common use a new kind of vehicle, propelled by motor power, and capable of going quite a long distance without any restriction being placed on its physical endurance.

The development of the motor vehicle has been mushroom in effect, and it has come to the country almost over night, and today has reached a state of perfection and quantity that is revolutionizing the transportation of the world. With this great change in the vehicle and power used has come a greater necessity for better and more improved highways. The distance covered by the motor vehicle in a day exceeds by four or five times the distance that could be possibly covered by the horse, and therefore the availability and usefulness of the highway is increased in like proportion. To meet the new condition brought about by the change in the vehicle the States who were giving State aid to the counties immediately realized that it was very necessary to construct a main system of State roads so as to properly take care of the new vehicle in carrying supplies from the points of production to the points of consumption. It was not long before a number of States established a system of State highways and appropriated large sums of money for their construction, also continuing State aid to the counties in helping them master this problem from a county standpoint. The extended use and number of vehicles increased more and more until it was recognized by the Federal Government that this question was no longer one that affected one State, but that the range that could be covered by the vehicle made it in a manner interstate traffic. The automobilist of one State very often used the roads in another State almost as much as those in the States in which he resides. This brought the National Government to the realization that to properly meet the great demand for better highways it would be proper and beneficial to assist the States with the construction of their State systems, and Federal aid was given to all the States.

We have seen how road development in a number of States has accelerated the use of the vehicle and what great prosperity it has brought to the counties and States where State highway development had taken place, the maximum use that is being made of the roads and the great service they are rendering the people at large. With this accomplishment in view it can be seen that the next step and the one that will produce the greatest benefit to the country as a whole will be the establishment of a national system of highways connecting up the large centers of production and tying the entire country together as a unit, forming a backbone of the main arteries, similar to our transcontinental railways. To this system the States can connect their highways, building out into the important producing centers and all the counties of the States, to which, in turn, the counties can connect with and build their systems out into every farming com-

munity, like the spokes of a wheel, touching every farm.

Such a plan would make a complete system, consisting of the main arteries being built and maintained by the Federal Government serving the country as a unit, a State system that would serve the State and be a feeder to the national system, and a county system that would feed the State system and reach out into every farming community, making a complete, practical and workable plan—a plan that would serve the highway transportation needs of all the people in the most efficient and expeditious manner.

Without the last step being taken by creating a Federal Highway Commission and establishing a national highway system there will be no guarantee that a connected system of roads in all the States will be realized, for it will take centuries under the present Federal-aid plan to accomplish such a result.

Each of the 48 States has one or more highway officials whose duty it is to look after State roads, but who have no opportunity or authority to make a study of the roads in the adjacent States that would serve the interest of both States in the most advantageous way. If two States were so fortunate as to have highway officials who would co-operate with each other and lay out a system of connecting roads, the terms of these officials heretofore has been so short and fleeting that they would never remain a sufficient length of time to see their plans carried out and the fulfillment of the purpose which they had in mind. With two exceptions in the past, Massachusetts and Virginia (two cases in the desert of destruction), the term of the State highway officials in this country average from two to three years—just about a sufficient time to break a man in and get him so he will be efficient and able to render to the State a service that will be of maximum value. As long as such conditions exist the road problem of this country will remain unsolved, and it is beyond all human conception why the people allow such conditions to exist. With the change of administration, whether of different political parties or not, there is generally a clean sweep made of the highway officials. If a Federal Highway Commission is created, political influence or a change of party will not disturb or remove the commissioners who have become proficient by experience in handling the highway affairs of the country. The undisturbed tenure in office of the members of the Interstate Commerce Commission, Federal Reserve Board and others bear out this conclusion. It can therefore be seen that a great saving will be had by continuing in office men who will make this their life work and who will render the maximum service and who have become expert in solving the many varied problems that enter into road construction. The example of good construction and maintenance will also be of great value to the road officials of the States and counties.

The great lack of maintenance and the slipshod methods that are commonly used cost the people millions of dollars annually. The commission handling national highways will render no greater service than demonstrating to the people and to highway officials at large a proper method of maintenance and a method that will be efficient in keeping the roads in constant repair. Such a method means a minimum cost

in the long run and one that will give the maximum use to the user.

These are but a few of the economies and advantages that will come along with the construction of a national highway system, but the example of proper construction will be emulated by the States, counties, and even communities, to the betterment of road conditions. Some will say that the States can accomplish this same result without the nation coming in and interfering with their roads. We know that this is impossible, for how long, how efficient would any department of the government now operating through the States function if it was divided up into 48 separate units over which there was no one in authority to co-ordinate or direct their efforts, or would there be any incentive on the part of any one of the 48 units to assist the other 47. Take, for instance, the Postoffice Department run in any such manner. You might be able to get your mail within a State, but what would happen to those who lived beyond its boundary? It is the opinion of the writer that no objection can be raised to the Postoffice Department and a number of other Government departments now operating in the different States. It has been done many years without any conflict between the Federal and State authorities, and we all know that the parcel post, the rural free delivery, the Public Health Service and many other agencies of the Government have operated in the States to the advantage and welfare of all. Likewise, the Federal Highway Commission can build roads, the main trunk-line highways of the State, without interfering or violating any of the functions of the State, and can aid the State in co-ordinating its system so as to make a plan of the entire road building of the country that will constitute a system of roads serving the maximum number of people with a minimum number of miles and carrying a maximum tonnage at the least per ton-mile cost.

These are a few of the benefits that will be derived from a national system, besides greatly lightening the burden that is now borne by the State highway departments and county road authorities.

It would be well for us to consider at this point the tasks that confront the people in regard to the road construction and development that must be undertaken in the next 15 or 20 years. There are over 2,500,000 miles of roads in the United States, 200,000 to 300,000 miles constructed of a material capable of carrying the traffic that has been developed and now passing over them. There is a need for about 60,000 miles of national highways and 250,000 miles of improved State highways, and 300,000 miles of improved county highway, leaving over 1,700,000 miles of unimproved roads, many of which are important and will have to be maintained and kept in condition for at least eight to ten months of the year. Others are of so little importance that a small sum annually expended will keep them in a reasonable condition and safe for traffic. The cost to improve the roads as outlined above, to take care of the earth roads and build proper bridges, will be about \$17,000,000,000. This is the problem that the people are expecting of those who have charge of the highways affairs of this country to properly take care of within the next 15 to 16 years.

Every agency now engaged in road construction, and every agency that may hereafter be created to undertake the improvement of our public highways,

will have a big task to perform and one that will require the best brains, skill and energy of the nation to carry out this plan.

When we consider, however, the great amount of money that will be saved by the construction of such a system, the cost will be but a small item, for they will be paid for by eliminating the great cost placed on highway transportation by mud roads.

It was ascertained a number of years ago, when the density of traffic was nothing like it is today, that the annual additional cost to the nation for transporting its products over unimproved roads amounted to \$504,000,000. When we place on top of this the great increase there has been in traffic since that study was made by the Government and the saving in fuel by the improved types of roads now being built over those that were in existence at the time of this investigation, along with the great saving that would be brought about in recreational and passenger traffic, this amount will run up close to \$1,000,000,000 per annum, and would pay for the cost of improving the roads in the plan above outlined.

We must not forget, also, that in estimating the great benefit that will be derived in dollars and cents there is another benefit in the influence they will have on the life of the people adjacent and who use these roads constantly in their daily pursuits in life. A good road not only brings better life into a community, but it enhances the value of all the property adjacent thereto and quickens a new spirit in the entire citizenship. This in a national system would extend from one end of the country to the other and tie the nation together as a unit. One section of the country would have easy access to the other, making it possible for the people of one State to visit those of another, from the East to the far-distant West, and from the North to the South, bringing them together in a social way and a fellowship that will tend to bind the nation closely together, making a people who will understand each other better, removing sectionalism and, above all, producing better citizens and guaranteeing a stable Government and Americanism that will mean the best for all, regardless of clime or class.

It has been said that a national highway system was in the interests of the tourist and that it would be of very little value locally. To one who has made a thorough study of this situation and knows traffic conditions, this objection is rather amusing, for the traffic over the national highway system will be made up of local units that will use these highways from the farming communities into the large centers of population, and whereas there may be a short stretch between these great centers of production that will not be used locally and will be for local traffic. Granting that they were built purely for recreational and passenger traffic, they would, in the judgment of the writer, be worth even the price that they will cost, for there are now spent many millions of dollars annually on the other side of the water seeing the scenery of Switzerland and other countries, when equally if not more beautiful could be seen in this country if we had the proper highways to open it up.

There can be no greater benefit to the people at large than to open up the playgrounds, health parks and reservations of this nation.

The need for a national system is accentuated more

and more each day, and as the country becomes more developed this great need will be more urgent.

With the many strikes and the unrest of labor and the possibility of the tying up of the railroads at any time makes an auxiliary system of roads necessary and imperative to guarantee the safety of the nation. If we had a system of highways leading to all the important centers of population, the life of the people could be maintained many days by foodstuffs being shipped over these highways in sufficient quantities to feed them all. From this standpoint alone and the safeguarding of the food supplies of the people, this system of roads should be constructed with the least possible delay.

These are but some of the problems that will be solved by a national system of highways for home and peace-time use, but should there ever come a time when this country would have to use them for defense and war usage, then they would form the bulwark and be the means by which an enemy could be resisted and pushed back at almost any point. The national roads of France, as all know, contributed about as much to the success of the war for the Allies as any other means used in the great conflict. And likewise, it has been the history of the ages. Due to the improved vehicle, the method of transporting war supplies and equipment has greatly increased the value of the road and its usefulness as a means for handling armies quickly and efficiently. It is the consensus of opinion of our soldiers who have returned from the other side that we should have a national system of highways, and they should be constructed at the earliest possible date.

Therefore, why there should be any objections raised, and why should the nation hesitate in laying out and constructing a system of highways that will be of great value locally, that will be of great State value, that will be of great national value, in time of peace, in time of internal strife, when other forms of transportation have been tied up, and when the country is threatened or invaded by an enemy?

Why wait and postpone the starting of a plan that will make the entire nation a vital and powerful unit?

Mr. Thomas B. King, president of the Mississippi River Scenic Highway, has been appointed manager of the newly created highway department of the Memphis chamber of commerce. Mr. King will devote his entire time to furthering road building throughout the lower Mississippi valley, giving particular attention to advising as to materials and methods to be followed in road building.

At least one road engineer will get adequate compensation for his labor and skill—Texas has raised its state highway engineer to \$10,000 a year. He is the highest paid of all the State officials, but—Who is doing more important work?—Exchange.

The Sullivan county court at Blountville, Tennessee, has authorized the issuance of \$200,000 in road bonds for the purpose of extending the macadam road system in the county.

A \$5,000,000 road bond issue for the graveling of country road through the fourth and seventh wards of Crowley parish, Louisiana, was signed by the clerk of the Acadia police jury recently.

Arkansas Plans Much Road Work

Many Districts Making Preparations for Active Constructions

ARKANSAS HIGHWAY construction projects under way at this time are very few on account of weather conditions, practically all the work is delayed until next spring. Many of the districts, however, are making all their preparations for a resumption of active construction work as soon as the weather permits. At least ten of the projects are being held up by litigations, and practically all of the projects created by the recent extra session of the Legislature are awaiting definite action of the Supreme Court on test cases that have been brought to determine the validity of the acts, says a recent dispatch.

Because of the tremendous volume of the work proposed and the comparatively limited number of men and outfits available, continues the dispatch, the Highway Department is cautioning commissioners to move slowly, and not attempt to force through all projects with the reopening of favorable weather in the spring. This course will bring about lower prices through competitive conditions. The peak of high prices seem to have been reached, and now there is a downward tendency. It is believed that prices are likely to become more reasonable again unless an effort is made to put over a five-year program with limited facilities in one season. The natural tendency of such a course would be to eliminate competition, giving an opportunity to contractors to secure work at practically their own figures.

The work done during the past year has been the greatest in the history of the State, and is but the beginning of a program of construction that is to continue with increasing momentum until the whole State is covered with a network of hard-surfaced highways.

Since April 1, 1919, The State Highway Department has disbursed in State aid a total of \$419,415.31, covering the greater part of the State.

An analysis of a chart prepared by the engineers of the Highway Department showing the variation in cost of the several items entering into the construction of gravel roads in the State for the years 1918 and 1919 shows some interesting details.

According to this chart, the cost of an average mile of gravel road in August, 1918, was about \$8,800. This increased to the peak price of \$10,600 in July, 1919, after which it dropped to about \$10,400, the present average, and shows a slightly downward tendency.

The item of clearing and grubbing per acre varies from about \$80 in January, 1918, to about \$200 per acre in the summer of 1919, and it has since fallen to \$175 per acre.

Plain concrete has advanced from \$19.50 in January, 1918, to about \$28 at the present time, which is the highest point.

Reinforced concrete, including the steel, has advanced from \$26 to \$34 in September, 1919, and is now tending downward.

Twenty-four-inch corrugated pipe has advanced from \$2.75 to \$3.65; 24-inch vitrified pipe has advanced from \$2.60 to \$4.30, costing at this time more

than the corrugated pipe, the lines of average cost having crossed in June, 1919.

Less variation is shown in the cost of unclassified earth work than in any other item. Starting with 40 cents, it has advanced to 55 cents.

The cost of fence-moving, starting with \$1.05 in August, 1918, reached its highest point in December of that year, \$1.15, after which it fell rapidly to the present low point of 55 cents per rod.

The item which enters most largely into the cost of gravel road is the hauling of the gravel from the pit to its place on the road. Starting with \$1.25 in August, 1918, it advanced to \$1.50 in January, 1919, after which there was a drop to 95 cents in March, then a sharp rise to \$1.55 in July, followed by another drop to \$1.25 at the present time. This is for hauling, dumping and rolling, and does not include the original cost or freight. The cost of each additional mile per cubic yard varies from 40 to 60 cents.

No contracts were awarded during January and February, 1919, until after the extended roads program was formulated by the Legislature. The bids which were then made on projects started at a considerably lower point in the chart than they had been at the end of December.

These estimates are based upon 100 or more average low bids or contract prices, and not upon an average of all bids. They are for the standard type of gravel road, with 14-foot roadway. The estimates should be regarded merely as approximate, representing average conditions in various localities, depending upon local conditions. They are not published as a guide to anyone in making bids, but merely to indicate the tendency of prices. The highest type of roadways shows an increase in price of from 50 to 70 per cent. No contractor should follow these figures blindly, as there are innumerable local conditions entering into consideration on each individual project.

One noticeable feature of the bids during the last six months has been the great variation for the same project, sometimes amounting to as much as 50 per cent on the same road. It appears that the contractors had not been thoroughly advised as to conditions, or that they expected, on account of the large volume of work and the limited number of contractors, to get the contract at their own price with little or no competition.

Should all districts now provided for undertake to build at the same time, prices would again go skyward, since there is only a limited number of contractors and outfits in Arkansas or elsewhere available for doing this work. The wise course to pursue would be, therefore, not to attempt to force all projects through at the same time, but to give the contractors time to do their work properly, and, by thus distributing the work, secure better prices.

It is encouraging to note that since the peak prices of last summer there has been a general downward tendency in practically all items, and under relatively normal conditions this should continue for the future.



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"MUD ROAD IS POOR ECONOMY."

In this day of extravagance it is quite proper to preach economy and to practice this noble virtue wherever possible. The cheapness of money has led individuals and governments to think lightly of investing it in commodities little needed and causes of questionable consequence.

There is no longer any question, however, about the worthiness of the good roads cause, and funds properly expended for the development of the arteries of the nation are investments which bring great returns—in economic values, education, morality, religion, and all that tends to produce life more abundantly.

The only limit that should be placed on the amount of money set aside for good roads is that which the public pulse, the public purse, places. In other words, the ever increasing demand for better highways makes it impossible to spend too much money for the construction of good roads. Waste due to unimproved roads, says the Federal Highway Council, has already reached the appalling sum of more than \$500,000,000 a year. And the Council, like Southern Good Roads, is at a loss to see where is the economy of permitting this appalling loss to continue. We have not figured it out, but according to the Federal Highway Council, the savings of one year will more than cover the amount required to carry out the plans for extensive highway improvements set out in the National Highway Act for a period of four years.

Failure to provide funds for the construction of good roads is extravagance, not economy.

The rebuilding of the main thoroughfares of the county will mark a new era in Bourbon county, Kentucky, roads.

HOW GOOD ROADS FACILITATE PEACE-TIME

(By G. A. Kissel.)

THE INSTANT the United States entered the world war, the Government, through the war industries board and other boards and committees, found it necessary for certain manufacturers to turn their facilities and equipment over to the manufacture of supplies necessary for the army and navy.

The next big move by these same boards was to put a ban on all building projects and road equipments, as well as stopping work on those that had been started. This was necessary to release labor and materials for essential work to carry the war to a successful conclusion. Today we see the wisdom of these moves, but now that the war is over it will soon become apparent that the lack of good roads is going to be a burden in getting back to a "peace time" production basis as quickly as necessity warrants.

Two of the country's leading industries that will feel the lack of good roads the most and the quickest are those of manufacturing and building. Let us take up the former first:

To maintain the production necessary to meet the reconstruction demands abroad, material and supplies must be delivered on a definite schedule. There must be no interruption, otherwise production will be delayed.

That our roads, highways and byways will have to stand up under two or three times the amount of traffic is apparent when our factories, industries, mercantile institutions and even retailers are considered in regard to their stocks on hand.

Halt Customary Channels.

The day we entered the war, the customary channels through which we secured our raw materials, supplies, goods, etc., were at first interrupted. Shipments we had ordered weeks and months ahead were tied up because it was more important to move the supplies and equipment needed by the army than those for home consumption. Therefore, we had to draw on our reserve supply which we had stored either within our factories or in warehouses nearby.

Later on, the nation's industries and manufacturers began to turn their equipment over to the manufacture of Government goods. This, to a great extent, made up the deficit in our equipment that was being turned to Government work was kept busy on materials supplied by the Government; hence the draft on the manufacturers' reserve stock was lightened. By the time the manufacturers' entire equipment was being devoted to Government work, their stock of raw material for commercial work was practically exhausted.

Motortruck to the Rescue.

Now with indications that the government will gradually relieve the manufacturer from Government work, the question of getting the necessary supplies and raw material for commercial work is an important one. In fact, it will soon be one of the vital problems, and with the railroads being used to maintain our armies abroad, as well as the transportation of finished goods for reconstruction purposes overseas, it will undoubtedly be left to the motortruck to keep our industries, factories, mercantile institutions and dealers supplied with

materials and goods necessary to get back on a "peace time" basis.

Here is where the States with good roads are going to forge ahead of those communities with bad roads, and likewise it will be the industries in the former who will have the bulge on those in the latter.

It will soon be a question of not merely the scarcity of available materials, but a scarcity of good routes over which they can be hauled to the factories.

In building highways, you are insuring reliable and economical transportation. You are eliminating excessive freight rates, avoiding expensive delays and stopping high motortruck depreciation—all three of which are big factors that enter into the cost of doing business.

In every city and town, building projects that have been held up by the war will soon be rushed to completion. Expenditures of hundreds of millions of dollars will be made, providing employment for not only the returning soldiers, but men released by the factories formerly engaged in Government work. In the cities, prominent office and Government buildings, as well as municipal improvements of every character and description will make it necessary for building materials and equipment to be brought into the city. This means that the motortruck will have to take care of a big share of this transportation, and it is virtually necessary that this work is not delayed in any way.

Here is where poor roads are going to interfere with progress. Materials for such buildings will have to be hauled by motortrucks from distant points, and there will be hundreds of instances where this will prove necessary in order to hurry up construction or complete buildings that were halted when the building ban was put on.

The same is true of the lack of houses, flats and apartments, for which there has been created an enormous demand—a demand that makes it impossible for contractors to wait until the railroads have again been put on normal schedules. And here again, it will be up to motortrucks to transport these materials.

In the building and construction field alone it is going to cost tax payers millions of dollars if these materials have to be transported over poor roads, because the depreciation of motortrucks, the lack of speed while negotiating poor roads, as well as the loss of time in getting materials to the workmen, will boost up the cost of construction more than the average layman realizes. And it will be the same way with those property owners who are building new residences, apartment houses, etc. Estimates that were made before the war as to cost of material, labor, transportation, etc., based on conditions at that time, will have to be considerably raised, especially if their local Good Roads Associations have not put over good roads or improved highways.

Highways and the Average Citizen.

William Brown, average citizen, picked up his evening paper and sat down to read.

He read a headline: "Railroad Finances Crippled; Higher Freight Rates Coming."

"Ho-hum!" said Brown to himself. "I'm glad I'm not in the transportation business. Railroad finance means nothing in my young life." He turned over the page.

"Freight Cars Scarce as Traffic Demands Increase."

he read.

"Oh dear! That must be ough on the big producers," was about the extent of his interest in this fact. He yawned and turned over the page again.

Suddenly he saw something that did interest him. He read the article through twice, laid the paper down, and called to his wife.

"Sadie", he said, "Here's an article in the paper that says that eggs are going up to a dollar and a quarter a dozen." Wherewith was started a heated discussion on "what was the world coming to" and "what was the poor salaried man going to do."

It doesn't matter how much to W. Brown, average citizen, what happens to the railroads. You see, he is primarily interested in things that affect him intimately.

The other day Brown went out for an automobile ride. He struck a bad piece of road and blamed the motor truck for damaging highways. He had considerable difficulty at one place in passing a truck that was heavily loaded with freight, and said that he didn't see why they were allowed to monopolize the roads. It never entered his mind, of course, that the motor truck has as much right to the highway as he has; that it is producing—for him; and that it is helping to keep his living costs down. He didn't ask himself why roads weren't built strong enough to hold the motor truck traffic or why they weren't built wide enough to give plenty of room to both pleasure and commercial cars. He is, you see, primarily interested in things that affect him intimately.

Railway finances, freight congestions, eggs, motor trucks, highways, and William Brown, average citizen—all are related intimately one to the other. Railway freight rates are advancing steadily because their finances are so low. Freight congestions prohibit the normal flow of commodities from producer to consumer. These two conditions are big factors in the high cost of eggs to William Brown, the first by increasing their cost of transportation, and the second by decreasing their supply in relation to their demand.

Railway finances are low principally because their business under present conditions is unprofitable for them. A very large percentage of this loss is attributed to the inconvenience and delay of handling small shipments, short hauls, and transfers. Short haul transportation and transfer of freight within a city are largely responsible for car shortages and freight congestions—they necessitate leaving empty cars on sidings and spur tracks until they can be moved by engines, causing delay and loss of car space that otherwise could be used for long distance hauling where there is no waste.

Motor trucks, if given adequate highway facilities can do much to relieve these conditions. They can perform these functions more economically than the railroads. They have proven themselves capable of eliminating all of this waste in handling freight, and if given proper highways and proper recognition could take over entirely these forms of transportation that are unprofitable to the railroads and that congest their terminals, incidentally lowering the cost of eggs to William Brown, average citizen.

Sooner or later Brown is going to cast his ballot on the good roads question. Wonder what he is going to do about it?

Success and Failure of Bituminous Macadam

By F. C. PILLSBURY, of Massachusetts

MANY miles of very good roads and streets have been built of bituminous macadam, and, though subjected to more or less heavy travel for several years, in many instances show little if any, effect of wear. While they are not as permanent as some of the more expensive types of paving, they may, when well laid, with the better materials, be safely adopted if they are not to be subjected to extremely heavy traffic.

Bituminous macadam possesses the advantages of being comparatively simple of construction, low first cost, and simplicity in maintenance. There are several varieties of this type of pavement, but all are very nearly the same in essentials. In all, broken stone is laid, rolled more or less, and the voids filled or impregnated with bitumen and the surface finally covered with smaller particles of mineral and finished off with or without a seal coat. These various types may be divided into three classes:

First class: One layer or one course.

Second class: Two or more layers or courses.

Third class: Bitumen and sand mixed grouts as distinct from the bitumen without sand.

The second and third classes include many different processes and methods, while with the first class there is but one method which, with some deviations, has been found to give really satisfactory results. The writer's experience with penetration work has been almost entirely with this class, so that it would seem better to confine the remarks to the first class, which includes only the bituminous surface laid in one course; in other words, when the wearing course is formed with one layer of stone penetrated with bitumen with or without a seal coat. This type is the simplest to specify and lay, and presents the least opportunity for difficulties.

Description of Construction.

Its actual construction may be described as follows:

On a suitable foundation is laid a base or bottom course of broken stone partially bound like water-bound macadam, on which is built or laid the top course or bituminous macadam.

The foundation must, of course, be such that it will be suitable at all times of the year. The base course must be sufficiently strong to reduce to a minimum, or practically prevent, vertical movement of the stones in the bituminous macadam, and the bituminous macadam itself should be so laid that the bitumen will surround all the particles of the stone, practically filling the voids and sealing the surface.

Factors of Success or Failure.

The bituminous macadam to attain this success must be laid according to approved methods. Bituminous macadam does not give good results when it is not so laid; that is, good results may not be expected from bituminous macadam when the materials or methods employed are not what they should be. There is fre-

quently a complaint of the waviness of this type of pavement, but it need not be built so as to be wavy; sometimes it becomes rutted or depressions or holes develop, but this can be avoided if the work is done properly.

The causes which lead to failure usually are the features which, if carefully considered and taken care of properly, will lead to success, and these causes for success or failure may be divided into four classes or subjects:

First, drainage and foundation.

Second, construction of the base as distinct from the foundation, meaning the bottom course of broken stone.

Third, top or bituminous course.

Fourth, the workmanship.

First, Drainage and Foundation.

It is a common error to lay the foundation of large cobblestones or broken fragments of rock in climates subject to frost action directly on soft clay quicksand or loamy soils, because these stones work up and down under traffic and frost action, the voids between them become filled with the fine earth beneath, and ultimately, frequently in only a short time—sometimes less than the winter season—the mud thus reaches right up to the bottom of the macadam. Of course, moisture accompanies mud, and there is a very unstable foundation which is more or less constantly in motion except when frozen solid or when thoroughly dried out. Finally, the bituminous macadam crust separates as it bends under traffic, and as it breaks apart in this way moisture from beneath works into the cracks or interstices at the bottom and from the top. Then destruction, more or less extensive, is only a question of time.

What should have been done is to lay a foundation of clean gravel or even clean sand or fine broken stone in preference to the large stone fragments, or if such stone fragments must be used because there is a scarcity of other material, they should be broken up much smaller, say, about 3 inches and less. Of course, when necessary the ground water should be removed with adequate drainage. These results obtain whenever the base is laid on material that will be affected by moisture or frost sufficiently to cause much movement. Moisture working up from beneath always shortens the life of any surface, and, strange to say, partly because bituminous surface is such a simple one to lay ordinarily, there seems to be an idea that it is not worth while to lay a proper base and foundation. It is probable that more than half the failures are due to this reason. Success is impossible unless the foundation is correct.

Second, Construction of the Bottom Course or Base.

The bottom course should be of sufficient strength to hold up the top course, that is, to support it so that it will not rut under traffic and will not be affected by any movement of the foundation or soil beneath the base. This is essential. The size of the stones in the base may vary from 1-2 to 3 inches or even 4 inches, provided there is a reasonable proportion of the larger

with the smaller sizes. It would not be good practice to use over 50 per cent under 1 1-4 inches in size, but would do no harm if they were all 3 inches large. Then this bottom course must be very carefully spread and rolled so as to be uniformly parallel with the finished surface. This provides for a uniform thickness of the bituminous macadam. In the base it is well to partially bind it with sand, fine screened gravel, or stone screenings, using the steam road roller, and, if necessary, sprinkling occasionally with water. But this bottom course should not be so rolled as to be absolutely firm; it is better for it to be slightly loose because this looseness will permit the taking up of the very slight unevenness unavoidable in spreading the broken stone of the top course, and thus resulting in a smoother surface. In other words, this bottom course should not be too rigidly bound, as is sometimes done with the usually accompanying result of a slightly uneven finished surface in the road.

Third, the Top or Bituminous Course.

This brings us to the bituminous macadam itself, the materials of which are the stone and the bitumen.

The broken stone should not be so soft as to crush under the roller so as to fill the voids before the bitumen is applied. When this occurs the bitumen does not fill the voids, and from such spots slack of bitumen there may arise two bad results. There may be a breaking up of the surface because the stones have nothing to bind them together. The best results are obtained when hard rocks are used, such as trap rocks. There are many localities where it is impossible to get trap rock or stone with a coefficient of wear sufficiently high to obtain results required. In such cases bituminous macadam should not be laid. For ordinary traffic such as exists on most of the main through State roads bituminous macadam can be laid economically, provided broken stone has a coefficient of not less than about 15, and provided the bitumen is of suitable quality. The size of the broken stone should be 1 1-4 to 2 1-2 inches or 3 inches, according to the thickness of the course. A top course 2 inches thick may be obtained with 2 1-2-inch stone, while a 3-inch course may be obtained with the larger size. If the traffic is very heavy, it is better to lay the thicker course with the larger stones.

The quantities of the bitumen for the 2-inch road are 1 3-4 gallons for the first application and one-half gallon for the second, or seal coat, and should be very closely followed. For a 3-inch road these quantities will be increased about three-fourths gallon in the first application, although this depends somewhat upon the hardness of the stone and the weight of the traffic. If the stone is very hard, it would be better to use a little more bitumen, as the voids will be greater with the harder stone. For the same reason, if the traffic is light, there may be a little more bitumen used than when the traffic is heavy. The quantity should not vary more than one-half gallon per square yard on a 3-inch road and one-fourth gallon per square yard on a 2-inch road.

Fourth, Workmanship.

The general process of laying a bituminous macadam is such a simple one in theory that nearly everyone considers it unnecessary to go into the details of construction carefully and does not realize the many little things that have to be done with the greatest care to get good results. This is a matter of good workman-

ship. Carelessness in any respect at any time is sure to lead to imperfect results. It may be that specifications are not sufficiently complete to cover all these details.

The work of laying of the top course of the bituminous macadam consists of the following operations, in the order in which they occur:

- (1) Spreading the large broken stone.
- (2) Rolling of this stone.
- (3) Correction of imperfections in spreading or any unevenness developing while rolling.
- (4) The first application of the bitumen.
- (5) The first light spreading of the peastone, brooming around of the first spreading of the peastone so as to have it absolutely uniformly distributed that there may not be an accumulation any depression which may have occurred under the distributor or for any other reason, so that there will be absolutely just a very thin sprinkling for the first spreading over the entire surface to be rolled.
- (6) The second rolling.
- (7) Sweeping off of the surplus peastone, dust, etc., in preparation for the second application of bitumen or seal coat.
- (8) The second application of bitumen or seal coat.
- (9) The final covering of peastone, to be very uniform and broomed about after being spread by the shovels to insure uniformity in thickness.
- (10) The final or third rolling—and here I should state that the second rolling is the most important.

Causes of Waviness.

I have previously stated that waviness may be due to using a small size of stone in the bituminous surface. This is quite sure to follow the use of stone which does not exceed 1 1-2 inches in largest dimensions, which some of us know as No. 2 stone; in other words, this size of stone when used will almost invariably wave sooner or later under heavy or medium traffic. Under very light traffic the stone will stay in place and not wave unless there is a surplus of bitumen. Where the smaller stones are used the voids will be smaller and a smaller quantity of bitumen should be used. There should be fully one-half gallon less than when stone of the larger size is used, but then it has been the writer's observation results would seem to show that this size of stone should never be used except where the traffic is very light, simply because of its tendency to wave or move about under the traffic.

With the large-sized stone even if there is a surplus of bitumen there will be no movement of the stone nor waving the surface unless there may be such a surplus of bitumen on top of the stone that it has the appearance of waving. But this surplus can be removed with grub hoes or hot shovels and should be taken off immediately after it has been put on during construction. If the weather at that time should be too cool, it will not be very serious if left on the road until warm weather comes again.

Best Time For Laying.

There is no reason why this type of bituminous macadam will not give good results in any climate, but it should not be laid in the late fall in the Northern States, as the bitumen cools in place so quickly that it prevents proper compacting of the stone. There have been instances where the work was done late and it was necessary to apply a second seal coat on account of the

openness of the surface, leading to considerable additional expense.

In spite of every precaution, as in the case of any pavement, some imperfections may sometimes develop. Frequently miles of road are built without any of these imperfections developing; at other times when the men are not fully experienced or will not take proper care after the road has been open to traffic, small spots will appear where there does not seem to have been sufficient bitumen and the stone starts to ravel. Examination has shown that this frequently is due to the presence of a foreign substance on the surface when the bitumen was applied. Care should be taken to see that before bitumen is applied there is nothing in the stone which would prevent it from penetrating the voids. In the fall of the year when leaves are dropping from the trees, it is sometimes necessary to have a gang of ten men or more taking the leaves off the surface of the road immediately before application of the bitumen.

Usually imperfections of workmanship will develop within about 12 months of the time the work is done, and they may be corrected by patching, which should be done just as the work was done in the first place, except that bitumen may be hand poured, but stone and bitumen of the same kind, and the steam roller should be used.

South Carolina.

Mr. R. T. Brown, Assistant State Highway Engineer of South Carolina, says that about all the surveys have been made of nearly 500 miles of State highways, of which about 60 miles is under construction.

The commissioners for the Blytheville-Manilla-Leachville hard roads have awarded the contract for the building of this road to the Good Roads Construction Company of St. Louis, the price being \$1,211,910.92. This road will extend from Blytheville to the Craighead county line, touching Manilla and Leachville, and will total a distance of 50 miles. There will be numerous bridges and fills on the road and the contract calls for a road 17 feet wide, with seven inches of concrete without reinforcement and to be constructed in the most speedy manner, yet of the best materials and workmanship.

Conway county, Arkansas, will build, says the Forrest City Times, 144 miles of asphalt roads within the next two years. Grading is completed on five miles of the proved road from Durham to Chapel Hill, North Carolina. This movement is being promoted by the alumni of the University of North Carolina and several prominent citizens of the city of Durham.

Bamberg county, South Carolina, is alive to the necessity of good roads, and as an evidence of this fact the county commissioners have recently awarded the contract to build its link of the Columbia-Savannah highway to the J. R. Beasley Company, of Norfolk, Va., for approximately \$27,000. In accordance with the terms of the federal good roads aid, the road is to be built under the supervision of the State Highway Commission, the federal government paying for one-half of the cost of construction.

The board of supervisors of Wise county, Virginia, have approved a petition for a \$300,000 bond issue for roads in the Richmond magisterial district.

Good Roads Notes in Brief

Winn Parish, Louisiana, is to vote on \$1,000,000 for highways.

At a meeting in Hinesville, Georgia, recently, the opening gun of the roads bonds campaign was fired.

The board of supervisors of Wayne county, Mississippi has issued good roads 20-year 5-per cent bonds in the sum of \$50,000 to meet the federal appropriation of like amount for building public highways in this county.

Plans are being made by leaders of the good roads movement in North Carolina to insure the enactment of the proposed bill authorizing the issue of \$50,000,000 in bonds for the construction of permanent highways.

All the bridges on all of the highways from Gonzales, Texas, to Guadalupe county line have been completed.

From Montgomery, Alabama, comes word that a

Highway Primer

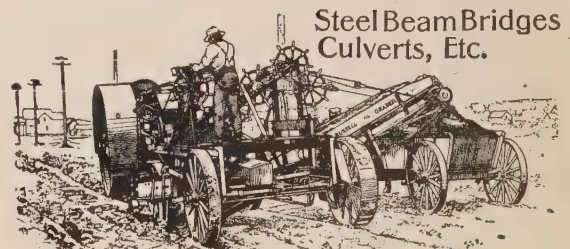
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Representatives in Principal Cities of U.S. and Canada

memorial bridge across Flint river to cost \$30,000 to be built in honor of the soldiers and sailors drawn from Madison county who gave their lives in the World War, is the plan of the citizens of the county.

The board of supervisors of Wise county, Virginia, have approved a petition for a \$300,000 bond issue for roads in the Richmond magisterial district.

A model bridge of the type which the Kentucky Road Commission will probably adopt soon for all Kentucky highways is being constructed by the students in the college of engineering, says a dispatch from Lexington.

From Birmingham, Alabama, comes the news that business men have been quite active in the interest of the county good roads bond issue of \$5,000,000.

The Mississippi Legislature has turned down the proposed \$25,000,000 road bond issue.

\$105,000 good road bonds carried in Irene district, Texas, recently.

A toll bridge will be constructed at Des Arc, Arkansas, across White river.

Arkansas county, Texas, has recently voted \$100,000 bonds for good roads.

From Stanton, Kentucky, comes the news that the fiscal court recently voted an issue of \$25,000 bonds, to be matched by State and Federal aid, for a trunk line through the county, and decided to sell \$4,000 more issue bonds to complete the road to the Clark county line.

McCracken county, Kentucky, commissioners have ordered \$17,500 improvement to county roads.

The Smith-Ross Road Bill has passed both houses of the Kentucky Legislature.

In Rowan county, Kentucky, arrangements have been made for building the Midland Trail from the Bath county line to Morehead.

The County Court at Lafayette, Tennessee, has directed the chairman to enter into a new contract with the State Department of Highways calling for the construction of a road from some point on the Macon county line near Westmoreland, to Lafayette, thence via Red Boiling Springs to the Clay county line.

McMinn county, Tennessee, proposes with state and federal aid, to build a twenty-six mile stretch of concrete road across the entire county.

A proposal for the bridging of Mobile bay and river and the construction of a highway to connect Mobile and thereby join the states of Alabama and

Florida with a good roads system, will be laid before the Mobile Chamber of Commerce, Automobile Club, other commercial organizations, and business interests of this city by a delegation representing the Escanabia County Good Roads Association.

Work on a new \$25,000 reinforced concrete bridge to replace the present Pillmore bridge over Shoal creek, six miles southwest of Joplin, Missouri, has recently been started, if plans announced a few days ago have been carried out.

Danville, Kentucky, is having a survey made of outlying streets and will soon start reconstruction work on them.

Haskell and Muskogee counties, Oklahoma, will



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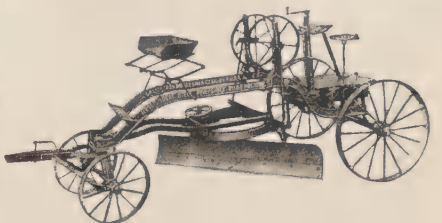
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co-operate in the building of a bridge across the Canadian river.

Poplar Bluff Mo.—That there is a strong probability of a bridge being built over St. Francis river between Butler and Dunkin counties, Missouri, on the proposed King's Highway tap line connecting Poplar Bluff, Missouri, with the main King's Highway is news coming from Kennet.

Knoxville, Tennessee, must begin to consider seriously the proposition of building another bridge across the Tennessee river, connecting North and South Knoxville, is the statement of Mr. John W. Flenniken, former commissioner of streets and public improvements.

The aim of Mayor Smith, of Louisville, Kentucky, to bring about the construction of a municipally owned or controlled bridge connecting Louisville and New Albany and Jeffersonville has met the approval of Mayor Robert W. Morris, of New Albany, and Mayor Newton Meyers, Jeffersonville.

The board of commissions of Calhoun county, Georgia, has ordered an election for bonds in the sum of \$150,000 for June 24, for the purpose of public road building.

Twenty districts in Collin county, Texas, have already voted bonds for road construction aggregating about \$4,000,000.

E. F. CRAVEN, Greensboro, N. C.

Will be glad to figure with you on your needs in Road Machinery.



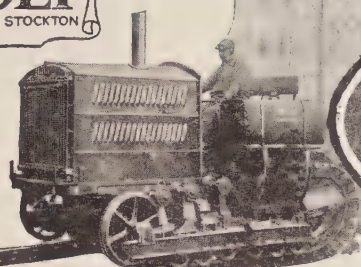
An 18" Diameter "GENUINE OPEN HEARTH IRON" Culvert Pipe in Use on the Weldon-Jackson Highway in Northampton County, N. C. Photograph Taken Feb. 17, 1916

THE photograph above gives an excellent idea of the resistance of "GENUINE OPEN HEARTH IRON" Culverts to extraordinary wear. It is not often that a Culvert of any type has to withstand the direct wear and tear of the heavy traffic coming in contact with the bare surface, but such is the case in this instance. This Culvert has been in use since the Fall of 1910, and as the picture was taken February 17, 1916, you can readily understand that it must have had rather hard knocks in that length of time. Our Mr. J. H. Slaughter took this photograph with a kodak and states that not only was this Culvert exposed in the manner shown, but at least a dozen more on the same road were installed under like conditions and have been subjected to the same rough treatment for the past few years.

We not only claim superiority for the material of which our Culverts are made, but also superiority of workmanship and therefore of the lasting qualities of our Pipe. We manufacture only one grade of "GENUINE OPEN HEARTH IRON" Pipe and have no seconds to offer in this material. Being a high grade material, it costs us more money than the ordinary grade of Galvanized Steel, and quite naturally we have to secure a better price for it. Therefore, beware of cheap Culvert Pipe.

The Newport Culvert Company, Inc., Newport, Ky.

On the Right Track



Honorably discharged soldiers of the Tank Corps who desire to qualify as Holt tractor operators are invited to write to us.

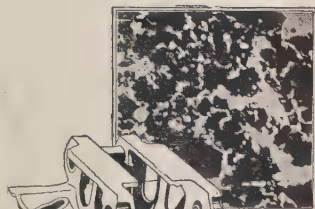
THE "HOLT-TREATED" track is typical of the lasting quality and *endurance* built into every part of the "Caterpillar" Tractor.

All sources of supply were thoroughly investigated to find the toughest, strongest, most homogeneous steel castings that could be had, for Holt track shoes.

Even these superior castings are all "Holt-treated" in electrically controlled furnaces—subjected to closely

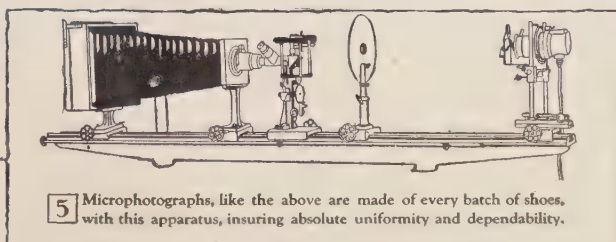
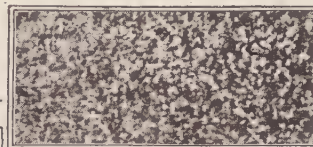
regulated cycles of heating and cooling—purged by fire *until their strength and toughness is increased 77% and their hardness and wear resistance 40% over the original high-grade material.*

Every shoe of every Holt track is subjected to precise tests to assure the maintenance of these high standards. Every batch of steel castings is given a searching chemical analysis. From every lot of finished track shoes, samples are microphotographed to reveal the inner grain of the metal. And from every lot of finished shoes a number are tested to destruction under the impact of a giant hammer.

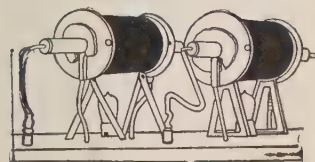


1 The Holt track shoe, as it comes from the steel foundry has a grain (greatly magnified like this:

2 After being "Holt-Treated" the grain is refined, the metal is toughened and strengthened and its structure is like this:

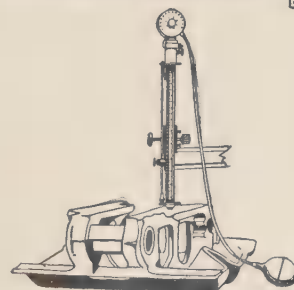


5 Microphotographs, like the above are made of every batch of shoes, with this apparatus, insuring absolute uniformity and dependability.



3 The carbon content of the steel is determined by means of electric combustion furnaces.

4 The hardness of every Holt track shoe is tested by a delicate and extremely accurate instrument.



TRACKS with endurance and shock-resisting qualities of the highest degree—with strength and hardness far exceeding Manganese Steel, without its elongation—are thus obtained by "Holt-Treatment" and maintained by Holt's exacting physical and chemical inspections.

The same science, skill and research that give the tracks of the "Caterpillar" Tractor the same long life of the motor and transmission, are applied to the making of every part of the Holt product.

Because of these refinements in production and the particular capability of its exclusive design, the "Caterpillar" Tractor is unequalled for road building and maintenance.

It hauls at half the cost of motor trucks, pulls all sorts of road machines and hauls enormous loads of trailers under conditions where anything except a "Caterpillar" is helpless.

There is no surer way to reduce taxes, to curtail the cost of road construction and to increase construction profits than to put "Caterpillar" Tractors on the job. Municipalities, road commissions and contractors alike are using them and find them indispensable.

You owe yourself or your community a "Caterpillar" Tractor.

Write for booklet "Caterpillar" Tractor Performance"

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There are, in this country, other vast stretches of valuable base which need only to be reshaped and consolidated in preparation for the application of a splendid wearing surface of asphalt.

In extreme cases the macadam material will at least serve as a portion of the foundation.

A two inch asphaltic macadam surface will adequately prepare

*Write for Asphalt Association Brochure No. 4,
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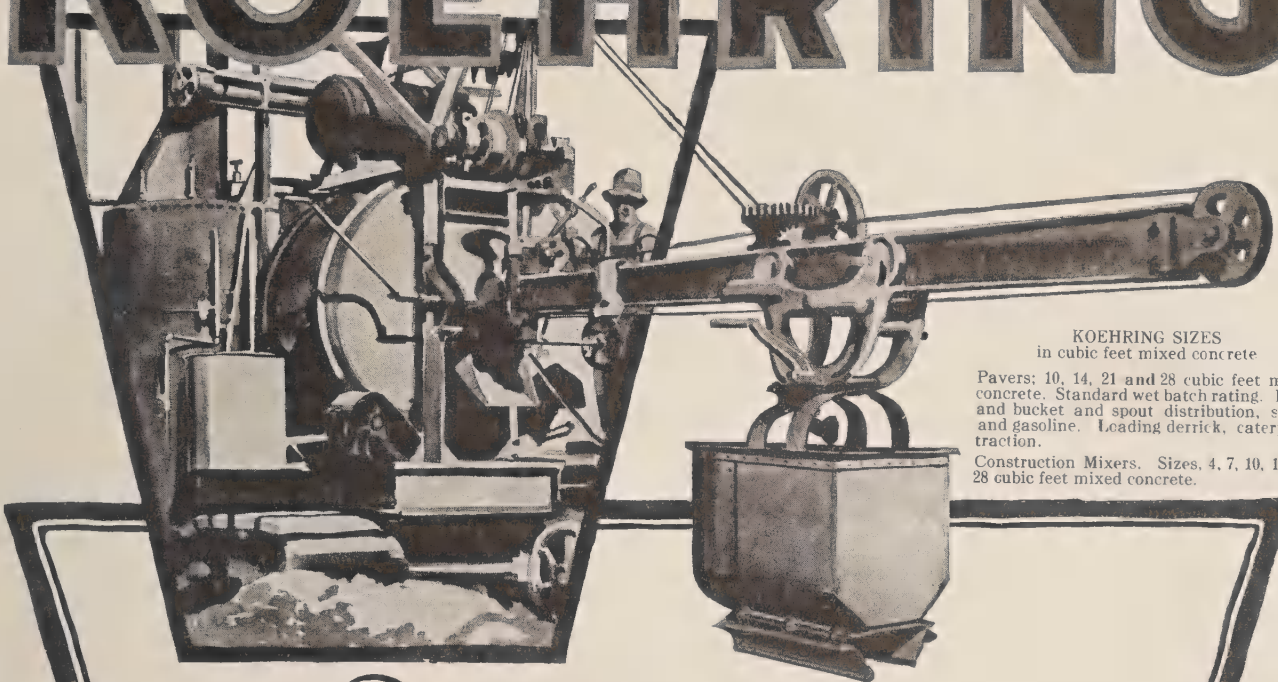
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HIGHEST speed operation in charging materials into drum because of high angle charging position of charging skip.

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All these features combined into the fastest paving unit by Koehring exclusive automatic actions which enable operator to maintain day-long, top speed operation—and all supported by the Koehring Heavy Duty Construction. Fastest distribution of any consistency of concrete to sub-grade because of Koehring boom and bucket distributing system, the greatest distributing range without moving the mixer.

Write for Mixer catalogue and Mixer Loader catalogue.

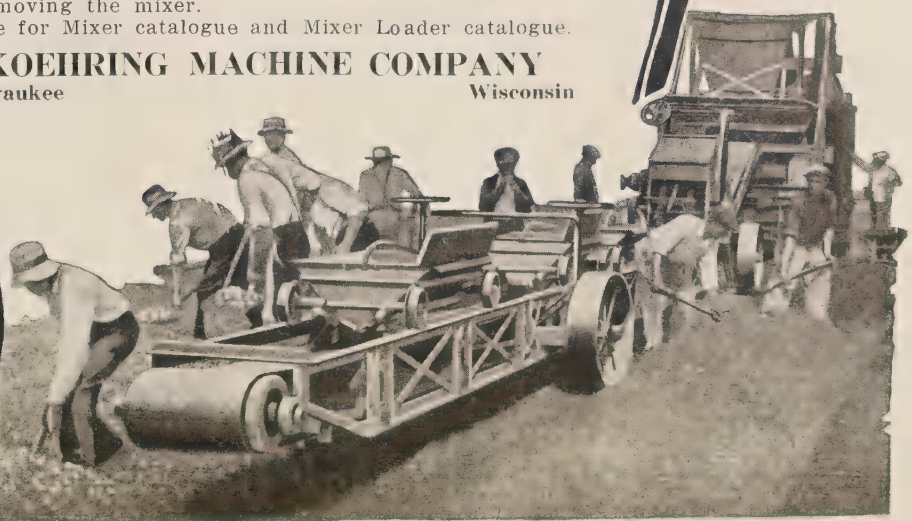
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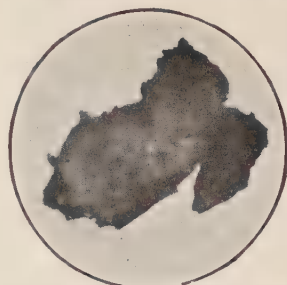
Loading derricks to lift batch boxes from cars or trucks to charging skip. Koehring Mixer Loader when materials are placed on sub-grade cuts out all wheelers.



Mineral Aggregate and Perfect Mixture

Make Kentucky Rock a Super-Asphalt

Here is a grain of silica sand, magnified 250 times. Note its irregular shape and note, also, that it is thoroughly coated with a black substance, which is bitumen.



This photograph, taken through the microscope, explains the wonderful endurance of Kentucky Rock Asphalt.

The endurance of a road is measured, first, by the wearing qualities of its mineral aggregate;

and, second, by the efficiency of the binder which holds the aggregate together.

Kentucky Rock Asphalt is from 92 to 93 per cent pure silica sand. This sand is so hard that one can readily cut glass with a piece of the natural asphalt rock.

100 Per Cent Coated.

Each grain of sand in Kentucky Rock Asphalt is 100 per cent coated with bitumen. Nature has done what would be commercially impossible with hot type or artificially mixed materials.

The importance of this perfect coating cannot be over-estimated. It insures a bond so perfect that the entire road surface is as compact and solid as natural asphalt rock.

The individual grains of sand are so firmly bound together that the road surface is absolutely dustless. Neither the rigor of weather nor the pounding of traffic can dislodge the particles of sand.

Because of its perfect mixture Kentucky Rock Asphalt is absolutely impervious to water. No moisture can creep into or beneath the surface to expand at freezing temperatures and destroy the roadway.

Does Not Crack.

Kentucky Rock Asphalt does not crack—neither does it roll, buckle or bleed. It does not lose its life, because it is a natural product laid without artificial mixing or heating. Samples of the material in use for ten years have been analyzed and found as live as when first laid. Where depressions occur in the foundation the Kentucky Rock

Asphalt surface often can be broken up and used for patching the hole.

Not An Experiment.

Kentucky Rock Asphalt is a proven surfacing material—second to none. Streets of the material laid in Buffalo in 1891 are in use today, and the cost of maintenance has been considerably less than that of other types. Kentucky Rock Asphalt laid in 1909 on the famous Nelson Avenue test road at Columbus, Ohio, was the only one of seventeen materials to pass the test. It is in good condition today, and not a cent has been spent for repairs.

Uniform Mix Assured.

Although the presence of the vast deposits of natural asphalt and its wonderful qualities have been known for years, the inaccessibility of the material resulted in its being removed and pulverized in an unsatisfactory manner.

The Kentucky Rock Asphalt Company, which now controls the field, has solved all transportation problems and is removing the material in a systematic manner.

Every ton of Kentucky Rock Asphalt which leaves the mills is analyzed in the Company's laboratory to assure a perfect mixture of sand and bitumen.



Laboratory where each ton of Rock Asphalt is testing

Kentucky Rock Asphalt, laid cold on an ordinary macadam base, or used as a resurfacing material on brick, concrete or other solid foundation, will produce a perfect surface.

The saving in mixing and labor make the first cost considerably lower than that of other high class types. The ease and cheapness of maintenance—the remarkable endurance of the material—warrant our assertion that Kentucky Rock Asphalt makes the best road at the least cost. We will welcome an opportunity to prove it.



Natural Asphalt Rock.

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Certainly this is the wrong way and it is NEVER to be recommended that any Culvert be installed in this manner.

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the
Triangle



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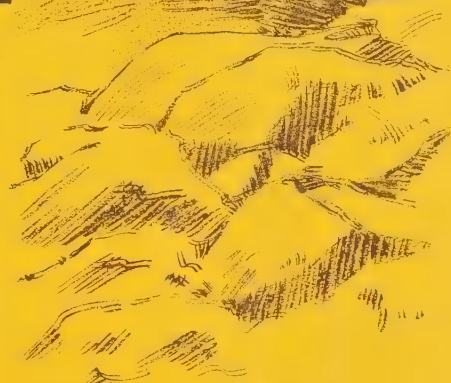
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Hercules Explosives are being used on a large proportion of the important engineering jobs now being carried on in the United States. Millions of cubic yards of rock are moved every year with the help of these powders.

But it is not alone in hard rock blasting that Hercules Dynamite is serving engineers and contractors. On big drainage and irrigation jobs, for river and harbor improvement, for clearing and grading public parks and playgrounds—in fact, for every kind of engineering work—Hercules powders are in general use.

Many engineers and contractors use Hercules Explosives exclusively. These powders have helped them to speed up work and cut costs.

If we can help you with any of your blasting problems, write us. Our Service Department will answer your questions promptly and fully.



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Concrete highways defy the poundings of traffic year in and year out. They won't blow away during dry weather, won't wash away in wet weather. Let weather and season change—the road won't—for any day, any season is just the same to a concrete road. It's not what they cost to build but the little they cost to maintain that makes concrete pavements economical.

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NORTH CAROLINA GOOD ROADS ASSOCIATION
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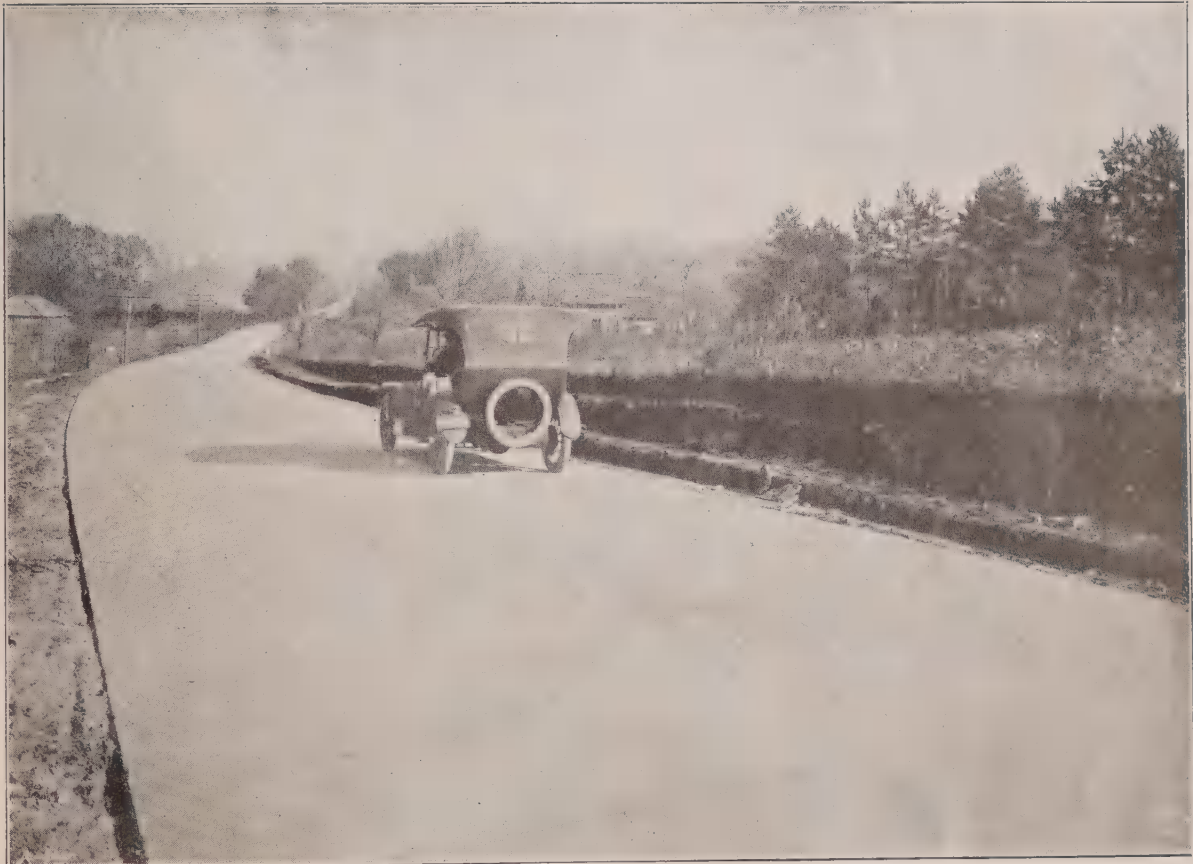
SOUTHERN GOOD ROADS

HIGHWAYS - STREETS - MOTORING

Vol. XXI - 5

Lexington, N. C., May, 1920

10c. a Copy



Asheville-Wilmington-Charlotte Highway Asphaltic Concrete on Old Macadam Base, with Concrete Border on Each Side

PUBLISHED BY

SOUTHERN GOOD ROADS PUBLISHING COMPANY
LEXINGTON — NORTH CAROLINA

SOUTHERN GOOD ROADS

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Lexington, N. C., May 1920

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Roads and Bridges in Buncombe County, North Carolina

By N. BUCKNER

Secretary Asheville Board of Trade

BUNCOMBE county, of which Asheville is the capital, is the best paved county in the South, and an active, energetic center for the hard surface road movement in North Carolina, and the South.

In round figures \$800,000.00 worth of paved roads, 31 miles now under construction by the present board of county commissioners composed of B. A. Patton, Commissioner of Finance; Otto Israel, Commissioner of Public Highways, and G. F. Stradley, Commissioner of Public Institutions. This mileage will be completed in the spring and summer of 1920, making a total of 163 miles of paved highway in Buncombe county, at a total cost of about \$2,000,000, in addition to \$554,000 worth of bridges, most of which are concrete and steel.

In addition to the improved roads in Buncombe county and to those already built in Western North Carolina, the State Highway Commission, western district including 22 counties, now has under project 264 miles of hard roads, every mile of which is either on or leads to intersect with some important highway leading to, or directly connecting with, one or more of the highways into Asheville. Nearly \$2,000,000 is now available for highway improvement in this district, those figures including, however, the federal aid, state aid, and funds appropriated by counties to augment state and federal aid. This amount will be spent on the following highways: Central, Asheville-Charlotte, Asheville-Brevard, Asheville-Murphy-Atlanta, Asheville-Burnsville, Spruce Pine, East Tennessee and Southwest Virginia, Boone Trail, and Blowing Rock highways, all of which lead to the Eastern branch of the Dixie Highway System from Maxinaw south through the great grain and cotton belts, and the wonderful mountain section of Kentucky, East Tennessee, and the "Land of the Sky" in Western North Carolina, which is Eastern America's climax in altitude and scenic grandeur.

The Dixie Highway across Buncombe county, which crosses the Tennessee line seven miles west of

Hot Springs, North Carolina, formerly used as a camp for about 3,000 interned Germans during the war, is paved all the way, a distance of 28.3 miles of heavy gravel on the western side of the county. Approximately 14 miles of this is asphalt-macadam, two miles brick, 10 miles of concrete. The ten mile stretch of concrete road south of Asheville to the Henderson county line was completed in May, 1919, the work continuing through the period of the war. The secretary of the Asheville Board of Trade, and T. W. Howerton, county road engineer, made a special trip to Washington and showed, to the satisfaction of the War Industries Committee in charge of the distribution of Portland cement, that the completion of this road was really a war necessity, in that it connected Asheville, where were located the United States army hospitals for wounded and gassed soldiers, and Camps Greene, Wadsworth and Jackson, 60, 70 and 80 miles distant, also on direct lines to the camps of Augusta and Atlanta.

This concrete road is 20 feet wide, seven inches thick in the center, tapering to five inches at each side. The cost of constructing this road, which before the war started, was around \$18,000 a mile, increased when the road was finished in May, 1919 to around \$25,000 a mile.

In addition to the 150 miles of hard surface roads in Buncombe county, there is approximately eight hundred miles of well graded top soil surface roads good for automobiles, eight to ten months in the year.

Some detailed information as to the cost of certain mileage of various kinds of roads follows: 19 miles of concrete cost \$406,464.26; 26 7-10 miles of asphalt over old macadam road \$339,999; 16 miles of water bound macadam cost \$133,000; 70 miles of sand clay road cost \$183,000. The above items were kept for these particular lengths of road and part of it at pre-war prices and part at war prices.

Approximately \$150,000 worth of reinforced concrete bridges have been built over the French Broad

river above and below the city of Asheville to replace steel structures washed away by the unprecedented high waters of July, 1916. The larger bridges constructed across the French Broad river mentioned in the following table, were all constructed since "the flood" except the West Asheville concrete bridge :

	Length Feet	Cost
Craggy, overhead (concrete)	650	\$59,000.00
Pearson's (concrete)	400	19,000.00
Smith's (concrete)	500	333,000.00
West Asheville (concrete)	740	71,000.00
Long Shoals (concrete)	250	10,000.00
Alexander Steel Bridge	350	14,000.00

In addition to these large bridges built prior to pre-war prices and worth twice as much now, quite a number of smaller concrete and steel bridges and concrete culverts have been built on the main arteries of travel in Buncombe county. The total cost of all bridges in the county is \$554,402, with the cost of steel bridges \$54,620; wood bridges, including those with "I" beams, \$24,250.00.

Buncombe county has commission form of government with three men giving full time to the handling of the affairs of the county.

Convicts from the Superior court of the county and the Asheville Police court are used for work on the public roads and are handled in well equipped sanitary camps permanently located and are taken to

work in a big White truck every morning and returned to the camp in the afternoon. The camps are all lighted with electricity with every sanitary convenience and the men are given an abundance of wholesome food. The county authorities feed the swill and waste to hogs at each camp. One or two cows are kept to afford cream for coffee and milk for cooking purposes. This method has proven quite economical, improves food qualities, and adds a touch of farm life to the unfortunate boys in the camp.

The county owns three quarries and a full complement of road machinery and equipment. The quarries are located on spur track of the Southern Railway, and the crushed stone can be loaded for shipment to the various points in the county on the railroad. Cars of crushed stone are occasionally sold in commercial channels at the usual profit. A recent profit shows value of road machinery at \$37,500; auto trucks and teams \$14,750.00, and quarries and land \$7,500.

An active campaign is being conducted in the Mart district, near Waco, Texas, in behalf of the proposed good roads bond issue of \$555,000.

Every county of West Kentucky has ordered the issuance of bonds for the building of the Jefferson Davis highway from New Orleans to Louisville.



Dixie Highway Between Asheville and Hendersonville, N. C., Concrete 20 Feet Wide. The Old and the New.

Location of Roads

By ROY T. BROWN

Chief of Surveys, South Carolina State Highway Department

IT IS worth while in studying road location to take a brief review of the factors that entered into the location of highways in the past. The first of these factors was, no doubt, the easiest way through, the "line of least resistance."

In the days when settlements were few and far apart, labor scarce and machinery lacking entirely the quickest way to open a line through was the one chosen. At first the roads were mere foot paths or bridle paths, which later developed into important highways.

Another important consideration in those days was that of local conveniences. Since communication would be chiefly between neighbors or nearby settlements of course the roads wound around by each cabin and often times considerably out of the way to pass by a mill situated at a convenient waterfall, or a large cleared area where much hay and corn were produced. In some cases the trail even went a

in many sections even after the said property lines have ceased to exist.

When communication became more frequent and the condition of the roads of more importance drainage became a factor in the location of roads. Since bridges were troublesome to build and culverts of hollow logs were used sparingly, the natural course was to follow the ridges. This method of location provided for the most part better drained roads than were secured by following the lines of least resistance or property lines, but it frequently necessitated the use of steep grades getting onto the ridges. Roads located on routes of natural drainage often went long distances out of the way to avoid crossing a creek or river. Such location, however, was a long step in advance over the principles followed previously. And today, with all our modern methods, materials and machinery, we will do well to keep the idea of natural drainage in mind.

The next factor in the development of the science of road location was the increasing use of wheeled vehicles. Previously most of the travel had been on foot and on horseback with only an occasional cart or wagon. But as wagons became more numerous, easier grades were found desirable. Steep grades continued to exist, however, but there was great improvement due to the influence of wheeled vehicles.

As traffic became heavier the need for better kept road surfaces became more obvious. In order to avoid the formation of great gullies along the wheel tracks on steep grades it became necessary to relocate the road around the hill instead of over it. Thus the requirement of a better surface came to be a factor in the location.

As the use of steel bridges became more common it became possible to avoid the long detours formerly necessary when a large stream was encountered. The road could then follow a more direct course and often serve communities previously cut off from it. But the road must get to the bridge site some how—and if the bridge were constructed at some other place than an old ford a new stretch of road was necessary. Often the connection with a new bridge was made on a temporary location and was an awful example of "how not to do it." But occasionally the advantage of the hill was taken and good location was secured. Such an improvement made a lasting impression on the users of the road, and soon they began to relocate around other hills and to bridge other streams.

In the early development of the principals of road location nearly all the factors tended to give crooked roads, with bad to fair grades, and of only sufficient width to enable two vehicles to pass by using the ditches. In many places these conditions still prevail to a considerable extent.

Present Day Tendencies

The conditions just described, however, are rapidly disappearing on the important highways of our



ROY T. BROWN

half mile out of the way to pass a good spring, just as it might do today to pass a good "still."

A little later, when the community was more thickly settled and fences became necessary the roads became property lines or were relocated so as to follow property lines. When new roads were to be opened they often had to zig zag around half a dozen fields to the mile, hemmed in by the timber on one side and a rail fence on the other. We are still suffering from the effects of property lines on road location

State as well as throughout the country. While we have possibly been one of the most backward states in the matter of road building we are at last recognizing the trend of the times and acting accordingly.

The effect of motor truck traffic has been to open our eyes to several needs, yes even absolute necessities, in respect to our roads.

First the coming of the automobile brought out the need of wider roads. We must be able to pass other vehicles without getting into the ditch. We must even be able to pass two other vehicles abreast on the main highways. We must also have a margin of safety in passing swiftly moving vehicles. These requirements mean wide roads.

Then we have found the need of better alignment. The shortest distance at which we are first able to see an approaching vehicle should not be less than three hundred feet. Even with a sight distance of this length two automobiles meeting at speeds of twenty-five miles per hour have only about four seconds in which to turn out and pass. Since the tendency is strong for both drivers to take the inside of curves the actual sight distance allowed should be six hundred feet or more on the center line of the road. To secure such a view as this of the road ahead requires long easy curves. When possible the curves should be so located that no buildings, high banks, or cliffs stand close to the inside to obstruct the view. Since such buildings may be erected after the road is built it is best to make the curve so flat that no building off the right-of-way can obstruct the view.

It is of course understood by road builders everywhere today that almost any feasible change of location should be made to eliminate railroad grade crossings. Counties can well afford to go to considerable expense to render an important highway free from these death traps. South Carolina certainly has its share of these, but it is very encouraging to see the great number that have been eliminated within the past two years. On one of the main highways in Laurens County fifteen grade crossings have been eliminated by merely relocating the highway. The same thing is being done elsewhere though possibly on a smaller scale. In cases where grade crossings are unavoidable even by the relocation of the road or by the construction of bridges or under-passes, great pains should be taken to secure a location for the crossing that will give an unobstructed view of the track in either direction. The crossing should be as nearly as possible at right angles to the railway for the same reason. The State Highway Department has established a ruling that on grade crossings constructed under its supervision the road must make an angle of not less than forty-five degrees with the railroad, both on account of the view and to prevent skidding when striking the track.

The tendency of the present is certainly toward better surfaces for our roads. This inevitably means that they must be so located as to secure easy grades. We cannot afford to build a hard surface on a road so steep that it would wash away on either side and undermine the surfacing. Motor truck traffic also demands that hard surfaced roads have light grades on account of the load. A difference of two or three per cent in grade can hardly be noticed on a road covered with six inches of mud. But cover it with

six inches of concrete and a difference of one-half per cent is noticeable. Thus the location today must be made with a view to securing light grades. This does not mean, however, that it should be made absolutely flat. Money spent on cutting a grade below one per cent had better be spent on building additional length of road.

Roads Should Be Direct.

Present day travel and traffic is not confined to neighborhoods nor even to counties as was formerly the case. Long trips for both automobile and truck are common. This means that the roads must be as direct as possible. Although the neighbors did not complain when compelled to go half a mile out of the way by Mr. A's door, the people from the next town or next state much prefer to go straight and leave off Mr. A's house. This becomes important to the community also when an additional half mile means an additional cost of fifteen to twenty thousand dollars, in the case of hard surfaced roads. So strong is the tendency nowadays to locate on the shortest routes possible that some times good sized villages and even towns are left to one side of a main highway. In cases of small towns with narrow crooked streets it is doubtless for the best interest of the great majority of the users of the highway to miss the town and allow it to have a branch road into it.

Another effect of motor truck traffic is to require much heavier bridges. As is the case with the roads, bridges need also to be wider than formerly. In view of the high cost of such bridges good location will eliminate as many bridges as consistent with good alignment and will utilize such crossings as will make the cost of bridges a minimum.

The use of motor vehicles and the extension of travel beyond the bounds of local communities has had another marked influence on the location of highways. A few years ago a road was often located with but little or no regard to the roads of the adjacent counties or states. Some times you have heard it said, "If they want to come over here let them fix a way to get to our road." Now the case is different, except in rare instances. The road authorities in one county or state want to consult those in the adjoining county or state so as to insure a suitable connection. Two counties will now issue bonds for a joint bridge between them, whereas a few years ago one would have feared the other would steal its trade.

A consideration of these factors, which have merely been touched upon,—shows that much is involved in the selection of a proper location for a highway. The location should be made only after thorough study of all conditions pertaining to the road under consideration and by a man experienced in weighing the relative importance of the different factors.

Chief Factors in Location.

The chief factors affecting road location are, in the speaker's opinion, the following, listed in order of their importance:

- a. Drainage.
- b. Grades.
- c. Alignment.
- d. Present and probable future traffic.
- e. Cost.

In these days when so many different kinds of cul-

verts and bridges are being constructed, streams and surface water are not such obstacles to road building as formerly. In general the location of drainage structures is made to suit the location of the road, particularly on important highways. Often, however, relocation of existing roads can be made, and certainly new roads should be located, so as to utilize desirable stream crossings and well drained ground. One feature of location that is often neglected is that of following southern slopes of hills and providing for plenty of sunlight on the road. While we in this State are not hindered much by snow drifts and ice, we do suffer from mud holes caused by the roads being shaded all day long. Probably no other one thing can accomplish so much for a muddy stretch of road at the same cost as to cut off the shade or to relocate it on a southern exposure. This is in effect a form of drainage since it helps to keep the road dry.

As indicated before, the matter of grades is of greater importance today than ever before. There is, however, nearly always in hilly country a conflict between good grades and good alignment. In many cases suitable grades and alignment can both be secured by a judicious use of curves, without seriously increasing the cost. In cases where the two cannot be combined at low cost, however, neither should be sacrificed for the other if the road is one of much importance. The only alternative then is more expensive construction, using heavy cuts and fills where necessary. The death of a single person, caused by a bad curve, would more than offset the saving of a few hundred dollars in cost. Then, too, with an expensive type of surface and the maintenance through a long period taken into consideration, the ultimate cost of the road with good grades and straight alignment may be less than that of one with poor alignment or bad grades.

The addition of one mile to the length of a road which carries an average of 100 motor vehicles per day costs the traveling public \$3,650.00 additional per year besides the extra cost of upkeep. This is equivalent to the interest on an investment of \$73,000.00 at 5 per cent. Hence from a business standpoint the public would be justified in such a case in spending a considerable sum to cut off the extra mile.

The location of a highway should also be made with due consideration to both present and future traffic. The amazing increase in volume of motor truck traffic and in the size of loads hauled within the past few years has upset many of our old ideas of road building and has shown us the necessity of looking to the future. It is equally important that we look to the future in our legislation so as to prevent unreasonable loads on the roads we are now building.

Along with the consideration of traffic requirements, present and future, arises the question of cost. In the past we are inclined to consider only present cost. We are beginning now to look forward to the cost of maintenance. County boards are now willing to spend thousands where formerly they hesitated about spending a few hundred. Sometimes our eagerness is so great for a smooth, hard surfaced road, which so many people seem to think will last forever, that we are willing to spend far more than the traffic for years to come will justify. But re-

gardless of the type of construction used at present the location should be such as to provide efficient transportation at the lowest possible cost for maintenance. It is obvious therefore that there is need for thorough study of both present and future cost before we make final and fixed locations of our roads.

North Carolina Legislature to Face Good Roads Issue

The special session of the North Carolina legislature which will meet in Raleigh during the summer will find themselves again confronted by the good roads question in spite of the fact that the session is called for the purpose of fixing the tax rate in response to the findings of the tax commission now working out the new assessments under the revaluation law.

When it is recalled that the provisional bond issue in the Stevens-Scale bill was small as compared with the proposed \$50,000,000 bond issue talked of by the North Carolina good roads association and Col. T. L. Kirkpatrick, it will be seen that the advocates of the big bond issue have a pretty big job cut out for them. They believe, however, that the people of the state will back them in an effort to get the big bond issue—that the members of the legislature have seen a light since they passed the present good roads law, which was merely a good beginning.

Whether the same members of the legislature which turned down anything which looked like bonds in 1919 have undergone a change of heart, remains, of course, to be seen. There are those, however, who make no bones of it in saying that there is little chance to get as big a bond issue through the the special session as there was during the regular session.

Tennessee Projects Held Up.

East Tennessee road projects are hanging fire for one reason or another in practically every case. Some of these will mean a loss of thousands of dollars to Knox county citizens because the roads will be impassable and keep tourists and others anxious to investigate East Tennessee possibilities from getting into the territory they want to see. Chief among these projects is the Kingston pike from Knoxville to the Loudon county line. From present indications it will be three or four months before actual construction can start on this road which will make it possible for only a small amount to be done before next winter. It is being held up by the red tape necessary to receive state and federal approval of the engineer's drawings. The surveys are completed.

Highway to North Carolina Line.

By terms of a bill recently passed by the South Carolina general assembly, a special tax will be levied in Anderson county through which \$70,000 will be raised in two years for constructing an improved highway from Pickens to the North Carolina line. The road will intersect with Transylvania county and will mean the completion of a highway from Columbia to the North Carolina mountains. This amount will be supplemented by a similar sum from federal aid, making \$140,000 available for the highway across the mountain.

Virginia Needs More Road Funds

By E. E. WITHERSPOON

WITH an unmistakably strong sentiment in all sections of the State in favor of the construction of better highways, Virginia seems to be having some trouble in getting a really comprehensive scheme of highways under way. Especially is this true of that great section west of the Blue Ridge mountains, and recently some of the cities of the West were moved to send delegations to Richmond to plead with the State Highway Commission for more substantial aid. They were told that all of the money in sight had already been apportioned. This will build here and there a link in the great Southwest, but at the present rate it will take a good many years to have anything like a system in that section.

The great need of Southwest Virginia at this time is the construction of through highways. The formation of Lee Highway Association was a step in the

there are still long stretches of it in very poor condition, while the apportionment of State and Federal funds is so small comparatively as to do only a little of the work within the next two years. If this should be supplemented by several hundred thousands of dollars by each of several counties the road could be built within a few years. This is especially true between Roanoke and Wytheville.

The northern end of the road, from Staunton northward through the Shenandoah Valley, is a most excellent one. Between Staunton and Roanoke some progress is being made and more money has been apportioned, but the wait has seemed a long one, and the road will not likely be opened before another winter comes.

A Historic Road.

It is a pity that more rapid progress is not being made in getting such a through highway opened. Here is a route perhaps unexcelled in America for beautiful scenery and natural wonders, and it wends its way through magnificent blue grass pasture where wander the fat cattle of more than a thousand hills. In history this ground is hallowed. Here trod the pioneers blazing the way of freedom and progress. Here marched Washington and Morgan and many others of enduring fame in the foundation of the Republic. Stonewall Jackson, Jubal Early, Phil Sheridan and thousands of others made this section doubly famous in the story of the War Between the States. At Lexington lie the dust of both Lee and Jackson.

Along the line of this highway are dozens of colleges and other institutions known far beyond the borders of the Old Dominion, and it penetrates a region far famed for its splendid hospitality. Here indeed would be a paradise for the tourist, but after he tries it once he never comes again. They have already learned that it is safer not to come too far south in Virginia.

Two Cities Isolated.

Roanoke and Lynchburg, the two principal cities of Southwest Virginia are to all effects cut off from each other except by train. It is a hardy motorist who risks his automobile to the dangers of the so-called highway between these cities in the summer-time. In winter it simply isn't done. A quarter of a million dollars is expected to be spent between the cities in the next two years. It will take a million dollars and at the present proposed rate eight to ten years to finish this route. It is plainly up to the courtesies and these two cities to remove this barrier.

If the stretch of road from Roanoke to Lexington were finished and a good road built through Virginia toward the North Carolina line thousands of tourists would flock that way and on up through the Shenandoah Valley. Few tourists come south but have a longing to go over the Shenandoah route. They can come down the Valley from the north, but they must turn around and go back the same way or else face tremendous motoring hardships.

The counties and cities of Southwest Virginia should call a big convention and decide to pool their



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right direction, but you cannot build highways on paper, as good as this one looks in black and white. Considerable enthusiasm was engendered prior to the formation of a permanent organization with D. D. Hull, of Roanoke, as president. This enthusiasm has subsided, at least temporarily, for funds to complete the highway seem nowhere in sight.

Counties Must Act.

If the Southwest Virginia counties depend on the State and Federal funds to build their main highways, without direct help from the counties, they are going to be waiting for a long time. Fairly good grades have long been established on the course of this proposed highway, but it will take much money to construct a good hard surfaced road from Natural Bridge to Bristol.

Some of the counties in the far Southwest end of the State have made some progress on this road but

interests and build these highways at once. It means just as much to one as it does to the other, yet a sort of gulf seems now to separate them.

Mud-Locked History.

Another road that Virginia should have at once is a highway from Danville north through Lynchburg and Charlottesville to Washington. Here again the main burden must be borne by the communities along the route. This route is both historic and beautiful. A Northern motorist recently said of Virginia: "She has more history than any other State in the Union locked up by her mud roads." Virginia is not only standing in her own light, but is subtracting from the usefulness of the highways built and being built through other States to the north and south.

The special session of the General Assembly last summer took a big step in the right direction, but a "big step" will only give matters a start. It is too big a task that Virginia has on her hands to handle solely in this manner. At the recent regular session of the General Assembly a good many counties were given authority to issue liberal sums of bond money,



Hauling Peanuts to Suffolk, Va.

but in no instances as large as are being used by many other Southern counties that are also getting Federal and State aid. Besides most of these authorized sums will be used solely on "feeder" or side roads and not on the State Highway System.

Virginia has a well organized State Highway Department, but organization without ready cash is not very effective. Commissioner Coleman himself recently said that all his department could do was to build a "few samples of road" in the various sections of the State.

Winter before last a big searchlight truck of the United States Army came south from Washington. It took a week to get to Roanoke, and it took three weeks more to drag it through the mud from Roanoke to the North Carolina line. It would seem a waste of words to declare this situation should not longer exist.

Association Getting Busy.

The Virginia Good Roads Association is now alive to this situation and is putting on a strong campaign to increase its membership to 10,000. The fees for memberships have been made such as to insure enough funds to keep open in Richmond all the year round an active office, with an all-time executive secretary

way Department. It is the purpose of the officers of the association to promote such agitation throughout the Old Dominion as will thoroughly arouse all classes of people to the necessity for action, and lots of it. Secretary D. B. Ryland seems to be a live wire and he will probably get results.

Another encouraging sign is the organization of strong automobile associations in the cities. These have in many instances increased membership fees and put on campaigns for more members. Executive secretaries are being secured and the automobile owners are getting in earnest for better roads. A large State bond issue is one of the possibilities, in addition to aroused local interest.

Road Building Era for Texas.

"Texas is entering upon an era of road building that will far exceed any period in our past history," said R. M. Hubbard, of New Boston, chairman State Highway Commission, who presided over the March meeting of the commission. The State of Texas has been allotted out of two appropriations made by Congress for aiding in the construction of roads of a total of \$16,091,000. Of this amount the Texas Highway Commission has granted allotments to various counties aggregating \$16,024,000.

The records of the State Highway Department, Chairman Hubbard said, show that to date applications have been completed by various counties for Federal aid amounting to \$7,022,652, and for State aid amounting to \$790,905. The total estimated cost of Federal and State projects to which the above amount of aid has been allotted, is Federal \$20,508,533 and State, \$1,042,899, making a total estimated cost of work for which applications have been completed for State and Federal aid of \$27,551,432. Of this vast amount of work Chairman Hubbard said the contracts have actually been awarded to date for work amounting to \$3,754,649.

Over 400 miles of roads that have been contracted to are in various stages of completion, according to Mr. Hubbard.

Roads in Western North Carolina.

In an interview with the Asheville Board of Trade, Wythe M. Peyton gave the trade body some very interesting statistics regarding road construction work in western North Carolina. And the matter of good roads and paved highways being one of the strongest factors for development in which the board of trade is interested, makes these figures doubly interesting.

Mr. Peyton stated that there are now 70.28 miles of highway now under construction in western North Carolina and that surveys had been made and completed on 220 miles of road, in addition to the above now under construction within the past six or eight months and that 13.5 miles of road are now being surveyed. In addition to this 41.25 miles of road in various sections of western North Carolina is now authorized and will be surveyed as quickly as the engineer can reach these roads from those now in process of surveying.

The Kentucky Fiscal Court offered \$50,000 in road bonds of Carroll county (five per cent) for sales but received no proposals.

The Engineer and Successful Road Location Construction and Maintenance

By T. F. HICKERSON

Associate Professor of Civil Engineering, University of North Carolina

THE time has arrived when arguments as to the advantages of good roads are barely heard. In fact people generally are keenly desirous of better roads immediately even at great cost. The road building program in the United States for the year 1920 exceeds that of any other known engineering project. About three-fourths of a billion dollars is said to be available for road improvement. Probably five times as much money will be spent on roads during this one year as was necessary to build the entire Panama Canal.

The most difficult problem in road building now is not how to finance roads but how to build them fast enough to please the public. There is danger

thoroughly scientific manner.

A few days ago, there appeared an article in one of the papers from a North Carolina county that is entering upon an extensive road building program, congratulating itself that the county had no improved roads whatsoever and therefore had no bad investments. It is paradoxical, of course, to say that any county without roads is fortunate, but this county does have the advantage of profiting by whatever mistakes have been made by other counties.

One of the greatest contributions of the Federal Government in connection with its aid to road building has been the rigid requirements for thorough engineering and the creation of state highway departments whose aim it is to work in conjunction with the Bureau of Public Roads and the various counties in planning and laying out a permanent road system.

In no phase of road improvement is the work of the engineer more important than in the location, because this is the only permanent feature. Numerous mistakes have been made in the past due to shortsightedness in the layout of roads. Some of these errors will never be corrected and others only at enormous expense. Before proceeding with the exact location, more attention should be paid to preliminary investigations for traffic conditions and the relation that the road in question bears to the road system. There may be several dozen considerations which exert more or less influence in the location, but the primary technical considerations are distance, avoidance of sharp curves, drainage and grades.

In hilly and mountainous country, grades are the first consideration in road location. Formerly, very little attention was paid to grade reduction. Directness was the only consideration. On soil roads it is highly desirable that no grade exceed 4 per cent. As the grade increases beyond 4 per cent transportation becomes burdensome and the washing of the soil due to the increased velocity of the surface water begins to show marks of destruction. From the standpoint of maintenance, grades steeper than 4 per cent, or at most 5 per cent, are very objectionable, since the tendency is for the water to cause little gullies across the road surface and make the side ditches wider and deeper.

During the past five years, automobile and motor-truck traffic has reached the degree of intensity and recklessness where safety to life demands the elimination of sharp curves to the greatest possible extent. It is desirable that curves shall be flat enough to allow an unobstructed view of 300 feet ahead so that motor vehicles can pass each other safely at high speed. This question of better alignment will undoubtedly receive more attention in the future than in the past. The curves of a highway should be laid with instrumental precision and never any more with the eye in a hit-or-miss fashion as has some times been the case.

If funds are limited, the engineer must decide



T. F. HICKERSON

in too much haste about building roads that must stand the requirements of traffic and satisfy posterity. Numerous experiences of the past have demonstrated beyond all doubt even to the laymen that roads should be laid out and built and kept in good condition according to a plan. Any well executed plan requires skill and time.

The highway engineers and officials in this country are facing a tremendous responsibility. There can be no guarantee of a wise expenditure of this vast fund without the freest application of scientific non-political methods. Engineers must have ample time and opportunity to investigate and plan thoroughly all the important features of roads that are to be built and kept up, so that whatever is done, is done in a

where technical requirements should be retained and where ignored; but he must plan the work so that whatever is done will become a useful part of any future improvement. In most of the counties in North Carolina, and I presume conditions are similar in South Carolina, funds are only sufficient to build a sand-clay or topsoil road, which may have to be changed to a hard surface road in a few years, to meet the demands of traffic. A road of this type should be located and designed with the same degree of care as the highest type of pavement. It should be permanently established with the best possible alignment, the easiest grades that the topography will reasonably admit of, the best drainage structures, and a good safe width. In fact, every road of importance should be located with the idea of permanence in mind. Certainly, there is false economy in building a surface on a road that has unnecessarily sharp curves and steep grades. This has been done, however, in a number of instances.

I have in mind a road in Surry county, North Carolina, between Dobson, the county seat, and Mount Airy, the principal town. Part of this road, that in Mount Airy township, was surfaced with top soil about eight years ago, no changes being made in the location. The topsoil material was excellent and for several years this was considered one of the best sand-clay roads in North Carolina. The surface of the road still holds up well, but the automobile traffic has reached such a degree of intensity that the sharp curves have become a source of great danger. The public generally and especially the farmers are clamoring for a new and safer location. The remainder of this road, that in Dobson township, was surveyed and relocated and topsoiled about four years ago; but the location is a tremendous blunder, as is obvious to any one who examines carefully the situation. The distance from Dobson to Mount Airy by this route is one mile too long and the grades on both sides of the wrong river-crossing are as steep as township road organization and not upon the engineering per cent. This is a glaring example of bad engineering; the responsibility, however, rests upon the neer. His methods of procedure were bound by local petitions and selfish interests of certain members of the township highway commission. This is a mistake that is apt to happen where a township attempts to locate a link of a county road system. The distance along the present road from Dobson to Mount Airy is 12 miles. The proposed new road which has been approved as a Federal Aid project will be only 11 miles long. Five miles of the so-called improved road, together with a new bridge, will be abandoned; thus throwing away an investment of approximately \$15,000.

We have yielded too much in the past to the temptation to follow an old established road-bed. Many of the reverse curves and steep grades that remain as permanent obstacles to modern traffic conditions could have been avoided at the beginning. But after houses are built along the road, changes in location are often expensive and not feasible.

In using money from bond issues for roads, it is important to distinguish carefully between the permanent and the temporary features of the improvement. The alignment, drainage structures, foundations, and grades may be considered permanent features if a competent engineer has done the work. It is not a

bad investment then to use long term bonds on the permanent improvements, but short terms bonds should apply always to the short lived improvements. It is, of course, improper to use bond issue funds for the maintenance of roads.

More attention should be paid to the aesthetic features of road planning. The roads of Europe are ahead of ours in this respect. Years ago trees were planted on the roadsides that now have a priceless value. It has been suggested that the state highway departments should have a landscape gardener to plan the beautifying of the roads laid out by the state. During the past two years, the Wisconsin Highway Commission has paid great attention to the question of appearance in bridge construction. An ugly bridge is an offense to every passerby, and a little extra money for appearance sake is well worth the cost, certainly for structures of concrete that are supposed to stand for all time.

Danger of Weak Bridges.

One of the most pressing problems before road builders today is the danger and delay caused by weak bridges which were designed for less than half the loads that the roads now have to carry. Mr. H. E. Breed, of New York, stressed this point at a recent transport conference. He gives the following facts: "In New York State there are 33,775 bridges. Of a total of 251 bridges on the three main traveled routes from the Pennsylvania State line to New York City, only 15 are built for 15 tons or over; 17.5 per cent of them are built for less than a 5-ton load; twenty-three of them would stand less than 3 tons; on the less traveled routes the status of bridges is worse."

Since about March, 1917, reinforced concrete bridges, according to the Wisconsin Highway Commission Report, have actually been cheaper even in first cost, foot for foot, than steel bridges of like capacity. This has led to the practical abandonment of steel bridges in Wisconsin and the large scale introduction of a superior construction material—reinforced concrete. The use of a more permanent type of bridge and culvert is more prevalent now in every state; and, for this reason, it is important that they are built for the loads that are likely to come upon them in the future.

Drainage is often referred to as the most important single consideration in road construction and maintenance. One of the great difficulties in the actual construction and maintenance of roads is that of turning the water reaching the road off from it so as to provide efficiently for the proper drainage of the roadway. The best ways of doing this often require very careful investigation. An improperly drained road foundation will not hold in shape even the highest type of road surface.

After the road is located, there is one detail of the design which requires the most careful attention of the engineer, and that is the placing of the proper grade line on the profile. Here is where hundreds of dollars may be saved by adjusting the grade so that the volume of cutting and filling will be a minimum.

Maintenance.

Road maintenance, of all problems in connection with better roads, is one of which we have the most to do and the most to learn. People have been slow in realizing that the maintenance of roads should be

gin as soon as construction ceases; and that it requires the supervision of an experienced engineer just as much as does the maintenance of railroads. The old system of maintenance was a failure because it was based on the assumption that everybody knew how to keep a road in good condition. The chief reasons why the roads of France have a greater reputation for excellence than ours is due to the close attention they have paid to maintenance. With the continued rapid growth in motor trucking, the responsibility for the safety of the bridges will have to rest upon the state highway departments or some official. This means that general inspections of all the bridges at least every year by men of experience will be advisable. The railroads have found that such inspections are essential to the long life of structures and safety to travel. An inspection of a steel bridge, for example, might reveal the fact that it is deteriorating very rapidly due to rust or other causes. Many concrete bridges are not permanent due to errors in construction. Unless concrete is made of the best materials, properly proportioned, it is apt to be porous enough to absorb water that would cause disintegration after freezing. In this connection, it should be mentioned that to secure the most efficient construction we must

have the concrete work executed by competent and experienced builders working under experienced supervision.

Excessive cost of road maintenance may be due to three causes: inefficient methods of maintenance, poor construction, or a wrong selection of the road surfacing material. It often happens that cheap first cost of construction leads to the most expensive road in the end. The selection of the most suitable road surface requires thorough technical knowledge, a familiarity with local prices and materials, a clear understanding of the present and probable future travel conditions, and a knowledge of the local social and political conditions. In no case can a wise choice be made without due consideration of all the factors involved.

In conclusion, allow me to emphasize again the importance of using the utmost care in proceeding with this road building business. Scientific methods should prevail everywhere. The pulse of the public should beat more patiently and less critically. It behooves the engineer and the contractor to work harmoniously together, both towards the same end of securing the most economical and lasting results.

National Good Roads Week

THE indorsement and co-operation of various organizations and public officials, including the National Grange, National Automobile Chamber of Commerce, Federal Board of Education, William G. McAdoo, U. S. Senator Capper, of Kansas, and U. S. Senator Townsend, of Michigan, has been enlisted in support of the Ship by Truck Good Roads Movement, which will be nationally celebrated during the week of May 17 to 22nd. The direct object of the campaign is to create public interest and promote legislation on the vitally important question of national highways, which, if favorably acted upon, will result in better roads, which will in turn serve as a stimulus for progressive truckmen to organize and operate a system of motor transport, utilizing the heavy duty trucks for the longer hauls to a terminal, from which point smaller trucks could serve to distribute.

The first organized step in the Ship by Truck Good Roads movement was made about a year ago, when ship by truck bureaus were established in sixty-five cities of the United States. The purpose of the bureaus was to bring together the shipper and the truckman, to serve in the interests of both and to protect the shipper from unscrupulous truckmen who seek to operate a motor transport system without knowledge of equitable rates or the practical roadways. Maps showing the locations of traversable roads are available at all times at these bureaus. This service alone has been of inestimable value to both shipper and truckman and has served to encourage both to redouble their efforts toward bringing about the recognition and acceptances of the Ship by Truck policy as the most practical for short hauls.

The Ship by Truck movement is not intended as propaganda to inspire competition with the railroads. On the contrary, the plan as outlined is directed and intended to assist the railroads, which is

evident from the advocacy of shipping by truck on short hauls only, as incorporated in the campaign slogan "Ship by Truck for Short Hauls." That the National Grange has promised to support and co-operate in the movement is conclusive proof that the farmer has visualized the possibilities of shipping by truck as applied in this particular case. With a truck system established, arrangements could be made for a daily or weekly call, by the truckman, for the products to be marketed and the farmer's time and the use of his team of horses could be utilized for work about the farm, whereas, formerly everything remained at a standstill while he himself conveyed his produce to market.

The support and co-operation of the Federal Board of Education has been enlisted to the extent of their conducting a Ship by Truck Essay contest, which is open to all high school students throughout the country. County, State and national prizes are offered, the national prizes being a four-year scholarship in any college or university in the United States, the donation of Mr. Harvey S. Firestone, president of the Firestone Tire and Rubber Company.

One of the principal events programmed to inspire interest in the Ship by Truck Good Roads campaign and to assist students in their essay efforts, will be in the showing, beginning May 1st, of a motion picture, "Ship by Truck," in nearly every city of the United States. This film, produced under the personal direction of Harry Levey, manager of the Educational Department of the Universal Film Company, has been especially designed to bring to the attention of the general public the economic advantages of the Ship by Truck plan and the contingency of the success of the movement upon concerted action which will bring about the passing of a national highways bill, which would result in a checkerboard of roadways, North and South and East and West.

"How You Gonna Keep 'em Down on the Farm After They've Seen Gay Paree?"

By W. D. LITZENBERGER*

THERE is more truth than ragtime in the above title, which is familiar to almost everyone as the name of a nationally-popular song. The thousands of young Americans who went abroad at Uncle Sam's expense, or worked in the large cities during the war, are finding it hard to stay "down on the farm." With the present lack of labor, more especially farm labor, thinking agriculturists should ponder this question.

There is only one answer—make the farm more attractive than the town or city for the boys. No doubt many will say, "It can't be done." But the writer contends that it not only can be done, but must be done and done now.

To begin with, the American farm has natural advantages and possibilities over any town or city. It

taining roads is not a tax burden, but an investment which pays big interest.

Good roads keep the worker on the farm, and the farm in a going condition; they increase property values and reduce overhead expenses in delivering products to market. In fact, money for good roads is the only money spent in the form of taxes that actually does pay a dividend.

Waco, Texas, road builders have received the contract for the largest job of strictly concrete roads that has ever been let in the Southwest, it is claimed. Messrs. Potts and Prentice, of Waco, will construct in Wichita county and around Wichita Falls 44 miles of such road, the contract totaling \$2,093,000.

Assembling of material began last month, and the work will be pushed. The feature about this contract is that the roads are to be of concrete even



Good Roads, which mean good times for the boys when work is over for the day, will help keep " 'em down on the farm."

is possible today to have every modern convenience in the farm home.

There is, of course, some grief in raising crops, etc. For that matter there is some grief to everything we do that is worth while. However, the wide range of modern farm machinery reduces this hardship to a minimum.

But no matter how modern the farm, or how conveniently arranged as regards labor-saving conveniences, a lack of good hard-surfaced roads connecting it with the town or city will isolate it to such an extent that life will become unlivable for the man who has traveled and who cannot at once cut himself off from the society of large centers.

People will say that it costs a lot of money to build or maintain roads—good roads. That it means higher taxes. However, money spent in building and main-

on the uplands. In nearly all counties in the Southwest the roads through the bottoms are concrete, so that water may pass over without injury, but there has been no extensive road building on the uplands with concrete. The roads in Wichita county will be 18 feet wide, and the longest single stretch will be 27 miles.

"The upkeep of the concrete roads will be negligible," said R. J. Potts. "The roads could of course have an asphalt surface if the people wanted to give them such a surface, but the maintenance of these roads will not be a large item."

The Waco firm has been growing rapidly for the past few years, and this last contract shows the magnitude of this firm, which started in a modest way not so many years ago. Most of the labor employed in the construction work in Wichita county will be skilled.

*Courtesy Highway Magazine.



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NO. 5

J. Ogden Armour is one of the world's big business men. His farsightedness has made him the head of a gigantic industry and a man of many millions. Armour long ago learned that waste must be eliminated in the packing business to make it genuinely successful. He realizes that there is a nation-wide waste in the lack of good roads, which factor adds largely to the cost of transportation of farm products, and thus contributes heavily to already burdensome living costs.

Mr. Armour has written just what he thinks of the part good roads should and must play in the national life and his advice is offered for the benefit of Southern Good Roads readers. Here is what he says:

The country is entering a period of road-building. Projects which were planned during the war are being put into effect. The Federal Government has made large appropriations, to be spent conjointly with appropriations by the various states. Good roads have become a watchword of post-war progress.

There is occasion for reflection in the fact that the greatest of ancient empires was conspicuous for its road-building. The Roman roads were the railways and telegraph of an age that did not know steam and electricity. They were the pathways of the imperial couriers and the imperial legions. These roads were the girders that held the empire together. It is customary, today, to admire the Romans for their practical sagacity, nowhere better exemplified than in their road-building.

In a manner "history repeats itself" in our newly bestirred zeal for constructing good highways. What to the Romans was a national necessity, has become for us an urgent need; and this by virtue of a modern invention—the motor car. I look for much advancement to grow out of the "motor age," and I am cer-

tain that this advancement will be contingent upon the attention we give to the improvement of our roads.

Those of us who have made observations for two decades have seen wondrous changes resulting directly from the use of the pleasure automobile. Once the city was the city, and the country was the country. Today they merge into one another. The city man knows the country as never before—is glad to have access to it and to live in it when possible. The country man knows the city and frequents it often. Small villages of yesterday have become the rural metropolises that one finds here and there, everywhere. That is all good, for it is well that a nation be knit together in the spirit of mutual understanding and in a reciprocity of advantages.

But there are better arguments for good roads than those which apply merely to the pleasure car. We are told, on the authority of the government, that farmers lose \$300,000,000 yearly in marketing their crops, because of bad roads. That is too much of a waste. We should contemplate this figure in connection with the high cost of living.

There is no more serious problem before us today than the matter of reducing the cost of getting the products of the farm to the table of the consumer. One step, at least, in the solution is plain—better roads.

As an instrument of economy the motor truck has yet to come into its own. Efficient servant as it is in certain restricted realms, it now awaits the further development of interurban and country highways to reach the measure of its full attainment. It has power and speed that put it outside the class of the horse-drawn vehicle, and a nimbleness and flexibility which gives it a certain advantage over the railways. It is my expectation to see it assume more and more the function of the "short haul" as its own peculiar province: in part, relieving the railways of those duties which they are least able to perform; and in part, expanding the field of our national transportation system.

I say, therefore, all speed to the good road movement! It will cheapen our methods of distribution and help to bring the people of our country closer to each other. I commend its common sense and practical wisdom. It may be less spectacular than some of our other national issues, but it strikes deep into the roots of fundamental progress.

North Carolina May Stop Road Work Awhile.

Until conditions return to normal and road building material becomes available in larger quantities, the Bureau of Public Roads has advised the several State Highway Commissions to curtail in so far as possible the letting of contracts for new road construction, and to accept no bids that were unreasonable. The suggestion is made public in a memoran-

dum issued by Frank Page, chairman of the North Carolina Highway Commission.

For several months the State and Federal highway departments have been seriously concerned over the mounting cost of road construction, and the inability to secure suitable bids for contemplated road work. Several States have been forced to abandon their road building programs for the year, and Mr. Page believes that North Carolina may be driven to the same conclusion in so far as it affects new hard surfaced road building, until materials become more available.

Recent projects advertised by the Commission have been without bids of any nature, and in one or two cases the counties in which the projects are located, the county has obligated to build the road for the Commission. Bids advertised for letting several weeks ago on three important projects brought no offer. The causeway over the Brunswick river in Brunswick county across from Wilmington, advertised for the latter part of April, received no attention from contractors, although it is one of the most attractive propositions offered by the Commission.

The letter to the Commission from the Federal Bureau is as follows:

"In view of the difficulty many of the States are experiencing in letting road contracts at reasonable prices, and in order that in your conference with State highway officials you may be better able to indicate our position to them, it has been thought advisable to set forth some of the principles it is believed should govern us under the present conditions in proceeding with road building involving Federal Aid funds.

"There seems to be no definite indication at present of any marked recession in the prices at which road work may be done. The cost of living since the summer of 1915 has steadily increased until it is now double the cost at that time and it is still increasing slowly. This is a result of the heavy demand upon the labor supply of the country for which the exceedingly active business of road building is partially responsible.

"It, therefore, appears to this bureau that widespread attempts to force through a too expensive program of road building will contribute very materially to further increases in costs and that we should take a conservative view on the letting of new contracts.

"It is thought that the program must be determined for the individual States or groups of States if the individual programs conflict.

"We believe care should be taken in awarding new contracts so that the completion of existing contracts may not be endangered and States which have a large amount of uncompleted contract work should proceed very cautiously in awarding new contracts.

"We believe care should be taken in awarding new contracts so that the completion of existing contracts may not be endangered and States which have a large amount of uncompleted contract work should proceed very cautiously in awarding new contracts.

"It appears desirable that a careful survey should be made in each State to determine the possible amount of road work that can be completed during the year and that only in very exceptional cases should contracts be awarded at this time which it

seems probable may not be completed during the year.

"Where more than one State is dependent upon the same sources of supply for materials, it seems advisable that there should be an agreement between the States as to the division of such materials.

"The wide variations in some of the estimates of cost received indicate the necessity for a clearer understanding of the conditions upon which they are based and the desirability of detailed cost analyses.

"It appears inadvisable to let contracts for which the bids are not in line with estimates of reasonable cost under present conditions made by the State and Federal engineers.

"It is believed that the foregoing principles if followed will safeguard the public interests in road work, even under the uncertain conditions and high prices now prevailing."

South Carolina Road Institute Organized.

After a two days meeting under the auspices of the three State colleges and the State Highway Department, the road builders of South Carolina recently organized themselves as "The South Carolina Good Roads Institute." Officers were elected and a secretary appointed. A part of the secretary's duties is to keep the members of the Institute informed as to current prices of cement, pipe culvert, structural and reinforcing steel, stone, and unit prices of construction work, and so on. Manufacturers of and dealers in any of these articles are cordially invited to file with the secretary monthly price lists. The address is: Secretary S. C. Good Roads Institute, care State Highway Department, Columbia, S. C.

"San-to-San" Loop in Texas.

The city of San Angelo, Texas, is to be made a turning point on a new scenic highway, connecting San Angelo and San Antonio and to be known as the "San-to-San" loop. The Circle Automobile Men's Association of America, which has dealers in every town, is behind the movement and will post the 500-mile route with markers, giving directions at all crossroads and the distances between points.

Northward from San Antonio, the loop will pass through Fredericksburg, Mason, Menard and Eden to San Angelo, then will lead south through Christoval, Eldorado and Sonora to Del Rio, thence via Uvalde into San Antonio. The entire route is over designated state or federal highways.

North Carolina Good Roads Association, Asheville, June 16, 17 and 18.

Miss H. M. Berry, acting secretary of the North Carolina Good Roads Association, announces that the convention of the organization will be held in Asheville, Wednesday, Thursday and Friday, June 16, 17, and 18. An interesting program is being worked out, and many problems of vital importance to good roads in North Carolina will be considered.

The Obion county, Tennessee, court voted the issuance of \$150,000 in bonds for the construction of the Jefferson Davis (Memphis to Paducah) highway through Obion county, from Troy to the Dyer county line.

One Million Dollars for Hard Surfaced Highways

Address By Dr. L. B. MORSE, of Chimney Rock, Before Annual Banquet of the Hendersonville, N. C., Board of Trade

AT THE last regular meeting of the Board of Trade a rather extraordinary spectacle took place. A million dollar hard surface program was proposed, sanely discussed by a small but most representative body of citizens, ways and means entered into, and plans formulated. The suggestion in no sense precipitated an attack of hysteria among the group present. No one even was heard to say, "it can't be done." The spirit of "it can and must be done" prevailed. This was truly an extraordinary spectacle.

Just what did this quiet, determined attitude of mind mean? What was it that happened? It can be summed up in one word—"Vision." The men gathered at that meeting had caught the spirit of a broader vision in road matters—a vision characterizing and befitting one of the most progressive communities in the State of North Carolina—namely—Henderson county. As is a man's home so is his State, or his county, exactly what he chooses to make it.

No one realizes better than did those present the effect of a suggestion of this magnitude. Times however, have changed—changed by leaps and bounds. The South has realized a material prosperity undreamed of a decade ago. North Carolina stands now very nearly the top of all the states in the money value of her agricultural products; and, in manufacturing, is recognized as perhaps the foremost state in the South. Despite the fact that Henderson county subscribed to approximately \$1,000,000 worth of war securities and war charities, the total bank deposits are now larger than they have ever been in the history of Hendersonville. We have just enjoyed the largest and most profitable season we have ever had.

Do we want a system of hard surfaced roads? There would likely be no serious argument concerning this point. If hard surfaced highways are desired, do we want them now or ten years from now? Probably the only valid reason that could be set up against tackling the big job at once is that we cannot afford it. It is hardly necessary, and time certainly precludes, the setting forth of the benefits to be derived from the building of permanent highways. They are too well recognized to justify more than casual comment.

Primarily the most benefit from improved highways is in the marketing of farm produce and in the amazing improvement and uplift in rural life which inevitably follows. No class of people approximates the farmer in tangible results. In a resort community, though, the tourist travel is its most cherished asset. We are—all of us—in the scenery and climate business. This is mainly what we are offering to our patrons—the tourists; and to render scenery more accessible and our climate more pleasurable,—this is, obviously, a most laudable goal to be at-

tained. This means roads—not ordinary roads, but the very best roads which we can possibly afford. The very best will be none too good for ourselves. We cannot place too high an estimate on living conditions for ourselves, for nothing so appeals to the prospective home builder. To enumerate all the benefits of a system of rural highways for Henderson county would be a well nigh interminable task.

Let us, though, ask ourselves frankly—can we afford the thing we want? Will it work an undue hardship on the public? Now the word "hardship" is altogether a relative term. A hardship of even three or four years ago may now fall into quite a contrary category. The amount or quantity of taxes a man pays becomes a "hardship" only when he hasn't the money with which to meet it. If the thing for which a man pays taxes returns to him benefits many fold greater than his tax, then the tax cannot, in any true sense, be construed as a hardship. That the benefits would vastly exceed the cost—would hardly admit of controversy. And too, the benefits are direct and not indirect.

Let us consider just this peculiar and most interesting phase of the situation. When Henderson county subscribed approximately one million dollars for war securities and charities, practically every dollar of this amount of money left the county. Of the amount of money raised for war charities, this will never be returned; whereas, of course, the Government Bonds and war stamps can be realized upon, but the rate of interest is low. This vast sum of money, in other words, **was** raised because of the high spirit of patriotism but the benefits were at best, remote and indirect.

In comparison let us consider what would take place if we vote approximately a corresponding amount—a million dollars—for hard surfaced roads. The entire investment would be made in our very midst, not a man, **woman** or child but would derive benefits of a very high order. Nor is this all—in the fulfillment of this work we would actually pay most of this money to ourselves. The largest single items of expense in road construction is labor. Expenditures for rock, sand, teams, and local materials could likewise be looked upon as being paid to ourselves. These two classifications represent approximately 63 per cent of the cost of high-class road construction at the present time; as against 37 per cent as representing the money that would be expended for cement, explosives, road making machinery, tools, etc.—**money** that would actually leave the county. These figures are approximately correct. They are, too, most significant and literally bristling in potential interest.

To carry the illustration further, it would appear that on the basis of a million dollar bond issue, 63 per cent or \$630,000 would actually be paid out for labor and domestic materials! So great is this amount that we would almost be in the position of eating our cake and keeping it too. If further, this \$630,000 can be

looked upon as being worth to the community the prevailing rate of interest, or 8 per cent, this would yield the sum of \$50,400 annually. So far as I am aware, this dominant factor as an argument for road bonds has not been adequately stressed, but its importance and significance cannot be too forcefully impressed upon the public mind.

Let us now balance this amount against the interest charge on the bonds. It is reasonable to believe that we could sell these bonds at an interest rate not in excess of 5 1-2 per cent, which would represent a yearly charge of \$55,000. It will thus be seen that these two large items practically balance one another. I recognize fully that this is a new phase. It sounds almost too good to be true, but the writer fails to see wherein the argument is unsound. If approximately two-thirds of the money is spent in our midst and left in our midst in cash; then, in the aggregate, is it not worth to the community the prevailing rate of interest?

The new re-valuation act will show a property assessment for the county of approximately \$18,000,000, and it is inconceivable that any business man would contend that we could not afford to expend the sum of \$1,000,000 for hard-surfaced highways in view of the great and far-reaching benefits which would most surely follow.

We are living in a rapidly progressing age. The automobile is here as the most dominant and far-influencing entity in the economic life of the world. This contention is not mine, but is being made and recognized by thinking men the world over. Whether, gentlemen, you accept my conclusions or not—the truth is, every syllable of what I have proclaimed here tonight is coming to pass. There is no alternative—none whatsoever. Hard-surfaced roads are coming—They are all but here. It is only a question of whether you want them now, or whether you wish to have them forced upon you five or ten years hence. We can either have them, when to do so will rebound to our credit, to our vision, to our example and our courage—or we can have them only when forced to do so and when we can hardly hope to reap a corresponding reward.

Let us each and every one set himself squarely to the task in hand. Let us vindicate the little group of men who had the vision for hard surfaced highways. Let us prove anew to the world the fact that Henderson county is in the van-guard of progress, second to none in her determination to measure up to the demands of the moment—yea, more than this—that she possesses the capacity and courage to anticipate the conditions which are so plainly inevitable.

This is vision—county-wide vision, constructive business vision, the sort of vision for which our estimable school board was recently given credit by Dr. Brooks, the Superintendent of Education for North Carolina. The thing can be done. Before me here tonight are the men to whom a progressive public looks for guidance,—and the public is becoming increasingly and rapidly progressive. Each year shows it less content with an antiquated order of living. It is for you, gentlemen, to say whether this great benefit shall be accepted now or be forced upon us five or ten years hence.

The road bond issue at Columbia, Tennessee, will be floated.

\$56,000,000 in Roads for Arkansas.

Arkansas road projects under contract, or completed since federal and state aid have become available, total 3,718.7 miles, and, when all completed will have cost \$44,022,000, according to figures made public by W. B. Owen, state highway commissioner. In addition, projects on which no aid was given total 557.9 miles, costing \$12,135,000, making a grand total of 4,276.6 miles at a cost of \$56,157,000.

The work of surveying various roads of Alabama under the new highway bill, which is preparatory to the expenditure of approximately \$50,000,000 in construction, was begun by the state highway commission Monday. It will be continued until every trunk road in Alabama has been gone over.

STATEMENT

Of the Ownership, Management, Circulation, Etc., Required
By the Act of Congress of August 24, 1912.

Of Southern Good Roads published monthly at Lexington, N. C., for April 1st, 1920.

State of North Carolina, County of Davidson, ss:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Fred O. Sink, who, having been duly sworn according to law, deposes and says that he is the Secretary-Treasurer of the Southern Good Roads and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations.

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—Southern Good Roads Pub. Co., Lexington, N. C.

Editor—H. B. Varner, Lexington, N. C.

Secretary-Treasurer—Fred O. Sink, Lexington, N. C.

2. That the owners:

H. B. Varner, Lexington, N. C.

Fred O. Sink, Lexington, N. C.

G. W. Johnson, Greensboro, N. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: NONE.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

FRED O. SINK, Gen. Mgr.

Sworn to and subscribed before me this 10th day of May, 1920

A. H. MICHAEL. (My commission expires, July 12, 1921.)

Lenoir County Building Roads

North Carolina County Has Over Million and Half Dollars of Construction Under Way

CONTRACTS have been awarded by the Lenoir County, North Carolina Highway Commission to T. H. Gill and Company for clearing, grading, and building culverts and bridges on ten miles of the road between Kinston and Pink Hill, and for the first three miles of the Snow Hill road.

Contracts have been awarded to the West Construction Company, of Chattanooga, for building forty-seven miles of paved roads at an average estimated cost of about \$37,000 per mile.

Below is given a table showing the roads awarded to contract with their length, width, estimated cost, and amount expended to March 1st. These roads are all very important roads and reach the different sections of the county as well possibly as it could be reached with the same mileage.

More than one hundred and fifty miles of roads have been surveyed in the county and a map of these roads has been prepared as the roads have been re-located for construction. Cutting out unnecessary bends, and straightening the roads as far as is consistent with proper service to the sections of the county to which the old roads served, has resulted in considerable saving in distance as well as in cost of construction. The distance from Kinston to Pink Hill has been shortened by three miles with the new location and the new road is little longer than a straight line from Kinston to Pink Hill. On the Snow Hill road considerable distance has been saved in the first three miles; and as the balance of the Snow Hill road and the Elm Grove road is re-located—while no great changes are expected in alignment—the new location of the roads will be much superior to the old.

Roads of Splendid Width.

All of the roads to be constructed are to be thirty feet wide with sixteen feet of paving in the middle of the road, except the Dam road which is to be twenty feet wide and paved for its full width. On this road there will be erected a substantial fence along both sides, which is to be painted white in order to serve as protection against vehicles going over the side of the road at night. There will also be concrete curbs on each side, which will extend six inches above the surface of the paving as an additional measure of safety to travel.

The new construction is to be made as permanent as possible, and Lenoir county upon completion of these roads can boast of as good roads as any county anywhere. The paving is to be of sheet asphalt an inch and a half thick after compression with a binder course an additional inch and a half thick and with a concrete foundation five inches thick, making the total thickness of pavement eight inches. The character of the pavement will be exactly the same as that on the streets in the City of Kinston except that the concrete foundation is made one inch thicker, as it is believed that the newly paved roads will bring heavier trucks into general use and thus materially increase the weight of traffic over the roads.

All bridges and culverts are to be built of rein-

forced concrete designed for a twenty ton road roller, the width of roadway of the bridges to be twenty feet. The bridges are to be of the through girder type, made necessary by the flat country and the necessity of economizing the area of the water way.

The amount of money shown as expended to March 1st is not indicative of the progress made on the work as all of the money thus far expended has gone for grading, clearing and grubbing, and culverts, and it is expected that beginning immediately very much more rapid progress will be made. On account of the lack of available materials for concrete it became necessary for the constructors to provide a new source of material supply, and a gravel pit has been opened with a capacity of 750 tons per day, which will supply this work, and the new pit is just now in position to make its first shipments.

The winter has been spent in surveying the roads and in grading them and in assembling equipment, and the work has just reached the point where it is expected that very material progress will be made.

Modern Road Building Plant.

The contractor has provided the most modern and best equipped plant for road building that has been seen in the South, and he has arranged that everything possible will be done with machinery instead of labor. Unloading will be done with cranes which will handle the material directly to the central mixing plant or to trucks. In fact, all unloading, handling, manufacturing, and laying of the pavement, will be done with machinery, so that it is planned to use only 65 men on each of the two outfits which will mean only 130 men for the entire job. A large central mixing plant will be stationed near Kinston for the manufacture of the paving mixture and five-ton trucks will be available to haul the material to any point in the county. It is expected that two miles of roads should be built per month, provided only that the materials can be delivered on the work.

The Commission feels that it has acted wisely in awarding these contracts as early as possible as it has secured a lower price for paving than any county that has awarded contracts since its funds were available. The same pavement is now costing from 25 to 33 per cent more than Lenoir county is paying.

This work is in charge of Gilbert C. White, Consulting Engineer, of Durham, N. C.

Roads awarded to contract, and estimated cost:

Road	Miles	Width of Paving	Estimated Total Cost
Pink Hill	17.3	16 ft.	585,632.05
Griston	8.3	16 ft.	254,776.40
Dam Road	0.5	20 ft.	22,788.90
Snow Hill	8.7	16 ft.	359,463.48
Elm Grove	8.2	16 ft.	327,075.18
Jason	4.0	16 ft.	134,679.31

\$1,684,415.32

Good roads mean higher land values.

Good Roads Movement in Texas

TEXAS will vote more than one hundred million dollars for good roads before the close of the year, is the belief of those closely in touch with the Good Roads movement in the Lone Star state. Already \$23,589,000 in good road bonds have been voted and elections have been called for the purpose of voting on \$33,848,000 additional making \$57,437,000 issued and proposed at this time.

In all sections of the state the movement for good roads is taking root and growing. It has taken only the lesson of other counties coupled with a campaign of education to apprise the people of every district of the untold values of good roads. Prominent among the advocates of good roads in every section, have been the returned soldiers. They have seen the value of good roads, if not in the hauling or receiving of supplies or war material, in their hikes.

The heavy influenza epidemic of last year coupled with bad roads which made it impossible almost for doctors to reach the stricken hundreds and thousands has also been largely instrumental in developing the wisdom of the "Penny wise—Pound Foolish" maxim. Hundreds died because they could not get medical attention and that attention might have been possible had the roads been passable.

Thousands of dollars were lost last year by farmers because of their inability to market their crops when prices were high. These things are also great boosters for the good roads movement. It can further be said that the people who live off the main roads are daily seeing the value of having a stretch of road improved even if it does not pass by their farms but makes hauling to town lighter a portion of the way.

Thus far approximately one quarter million vehicles have registered with the State Highway Department and the registration is continuing. With the war restrictions removed and with a good crop in the fall it is believed the number will near the half million mark.

Federal aid has been an incentive to the counties, and state highways already developed have shown to the people the intrinsic value of good roads. In addition the recent assignment by the government of a large number of army trucks to be used in road building purposes has proved advantageous as not only reducing the necessary expense for road construction and maintenance but also providing employment for many men whose services in the army have been in the motor truck branches, thereby insuring expert assistance of this kind.

The use of tractors is increasing. In 1915 approximately 1,000 miles of roads had been graded by tractors, in 1916 approximately 5,000 miles and in 1917 this grew to approximately 10,000 miles. It is estimated that last year in the neighborhood of 100,000 miles of road was graded by tractors of various kinds.

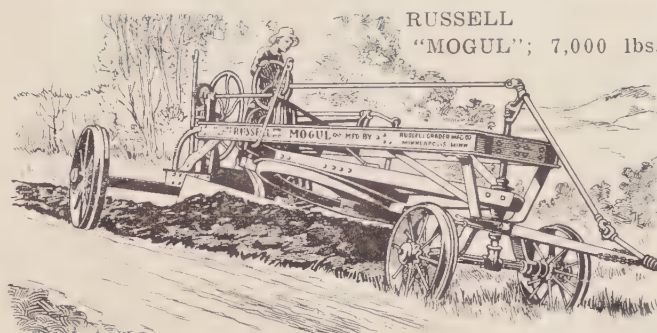
The State laboratory has been swamped and unable to meet the request for material tests for highway construction. More tests of this kind have been requested in a few months of the current year than in years of the past thereby evidencing in a way the interest in the good roads movement.

Texas is a state of 252 counties. Of this number forty counties alone have voted more than \$23,000,000 in road bonds. In other counties there are proposed is-

sues. In many counties the good roads movement is just starting. Many speakers are touring the state speaking on the subject of good roads, and effectively.

Texas, with a valuation on its farms, forests and mines, according to the Federal reports of \$1,125,179,744.80 pays into the government 4.36 per cent of money appropriated for highways throughout the United States. It is now working to get back its share and perhaps more in Federal assistance. Only three states of the entire United States pay any more into this fund, Pennsylvania, Illinois and Iowa, in the order named.

The fact has been further developed that Texas has been spending more money for amusement than it has for Good Roads, and this is having an effect on the broad minded citizenship. Texas has spent annually for tobacco alone \$4,160,000, for movies approximately \$5,000,000; value of musical instruments estimated at \$25,000,000; diamonds and jewelry at \$20,000,000, etc. Comparative figures show a far less pro rata expense



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for good roads than for pleasure. This is likely true elsewhere.

Motor freight has been developed to a point where the farmer is realizing the value of it. Not only the farmer but the town people and village people. They have found the possibility of getting their goods without a long delay and with the demand for motor freight and better and quicker service of all kind has developed the necessary demand for good roads.

Interurban builders are advocating the building of good roads. Good roads have followed the interurban and the interurbans are following the good roads. They may apparently be rivals, according to a prominent Texas interurban magnate, but they are closest allies, each developing the other. With the prospect of numerous new interurban lines in various sections of the state, road building has been given a boost.

A plan was developed by the County Engineer, in collaboration with the State and Federal Engineer whereby a complete system of 332 miles of road was worked out touching every section of the county. It comprises a belt line completely around the county, twelve radial roads from Dallas as a center to all sections of the county and six intermediate roads connecting the radial roads. The plan further specified the concrete and macadam roads, etc., and showed the estimated expenditure for every cent of the \$6,500,000 proposed in the issue, including culverts, approaches, grade reductions, crossings, etc.

Campaigns are being waged for good roads in Texas under the guidance of experts in instances where large amounts are involved. There is one firm in the state which handles nothing but campaign publicity work, and has handled publicity work alone for three Texas Governors, one United States Senator, several congressmen, for the Panama-Pacific Exposition, State Cotton Acreage Reduction campaign, Jewish War Relief Fund, raising \$500,000, Dallas County bond issue for \$6,500,000 and others. The firm is composed of two ex-service men, Captain R. C. Lowry and Lieutenant O. M. Lowry, of Dallas.

The State of Texas expects within a course of one year to have made provision for more good roads than any other state in the United States and to provide more trans-continental highway routes for the tourist than any state so situated geographically.

A resolution was introduced to issue bonds to the amount of \$300,000 for the two highways in Weakley county, Tennessee.

GOOD ROADS NOTES IN BRIEF

Announcement was made recently by the county commissioners of Gaston county, North Carolina, that 50 convicts from the state prison at Raleigh have been secured to supplement the county's road-building forces.

The county court of Cabell county, West Virginia, ordered an election to be held May 25, 1920, that the voters might approve or reject the proposed million dollar bond issue for the improvement of the roads of Cabell county.

An amendment has been made to the State Constitution of West Virginia to allow a bond issue of



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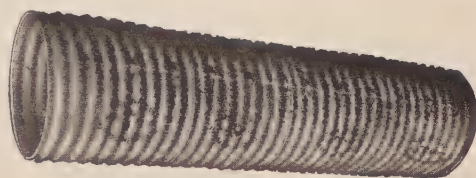
E. F. Craven, Greensboro, N. C.

and

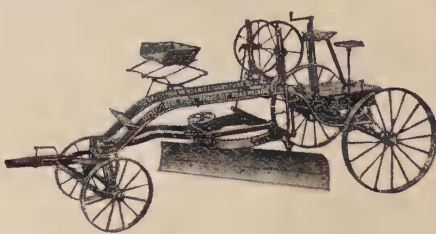
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fifty million dollars to improve West Virginia roads.

McNairy county, Tennessee, favors a \$200,000 bond issue for good roads.

A proposed \$290,000 bond issue has been finally passed by the city council of Meridian, Mississippi, and the matter will go before the electorate at an early date.

According to information furnished the Dixie Highway Association by Frank P. Rogers, state highway commissioner for Michigan, contracts totaling \$1,-846,911.64 in 17 counties have been awarded along the Dixie Highway in that state, covering 147 miles of highway. In addition to the mileage under contract, there will be constructed a large mileage on contracts yet to be awarded.

The district engineering board of the Alabama Highway Commission is putting three surveying parties in the field and their first work will be done on links in Madison and Marshal counties of the Alabama-Jackson highway.

The city of Savannah has just about closed its contract for the big paving plan it has underway. This ought to give Savannah a large number of newly paved streets before the end of the year.

Twenty-two highway engineers of Western North Carolina, representing both state and county, met recently in Asheville for the purpose of discussing highway improvement.

The people of Gibson county, Tennessee, are much interested in having the Meridian highway, which is the main thoroughfare extending through Gibson county and passing through Trenton and Humboldt and on to Jackson, established and hard-surfaced.

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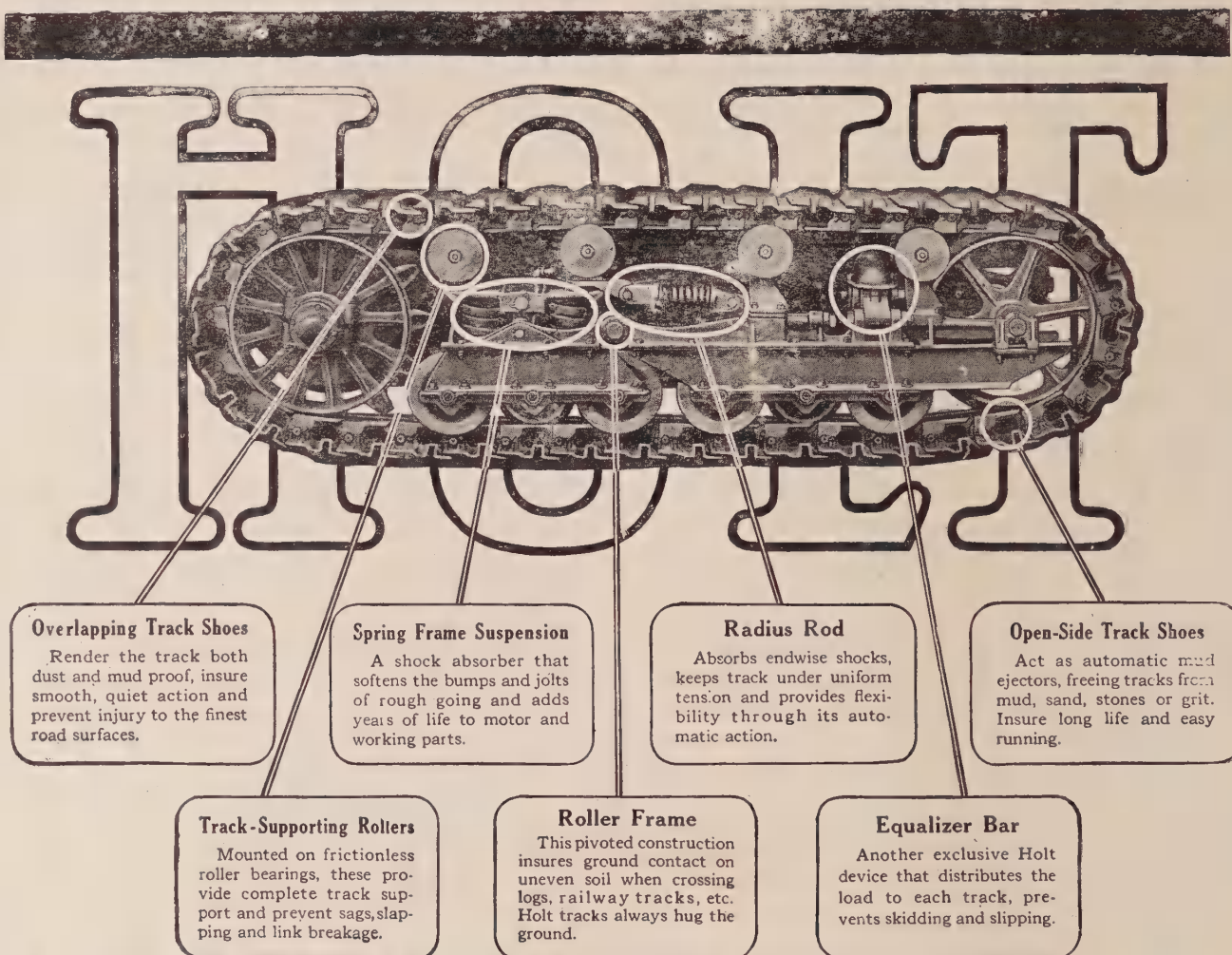
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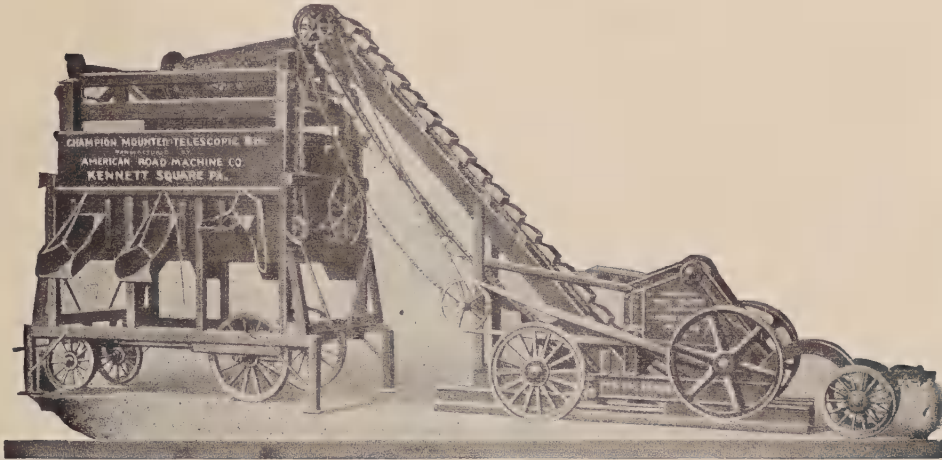


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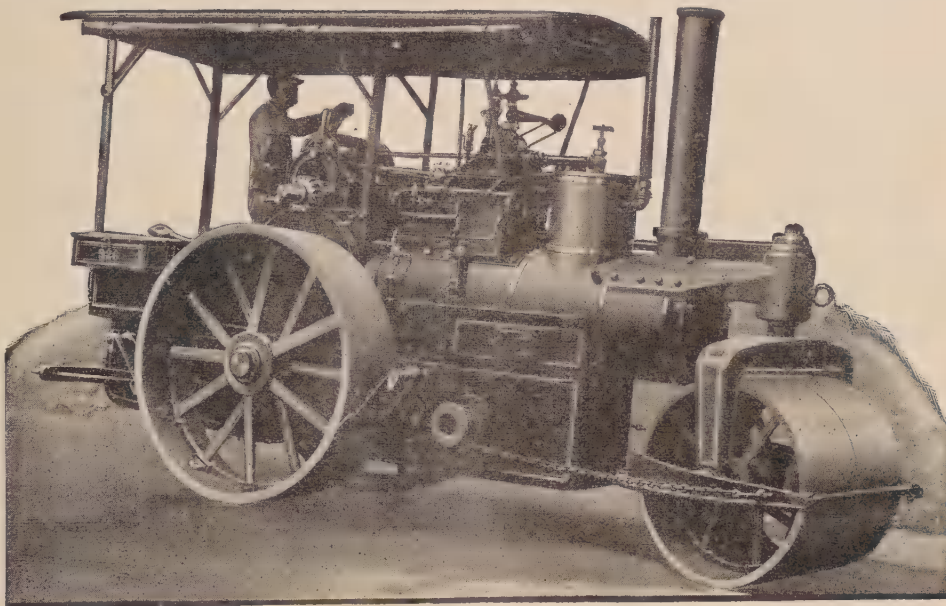
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Kentucky Rock Asphalt is super-asphalt. Its mineral aggregate is an irregular silica sand so hard it readily cuts glass. The natural bitumen, which binds the sand together, coats each grain perfectly. Because it is not heated or cooked, the bitumen never loses its life.

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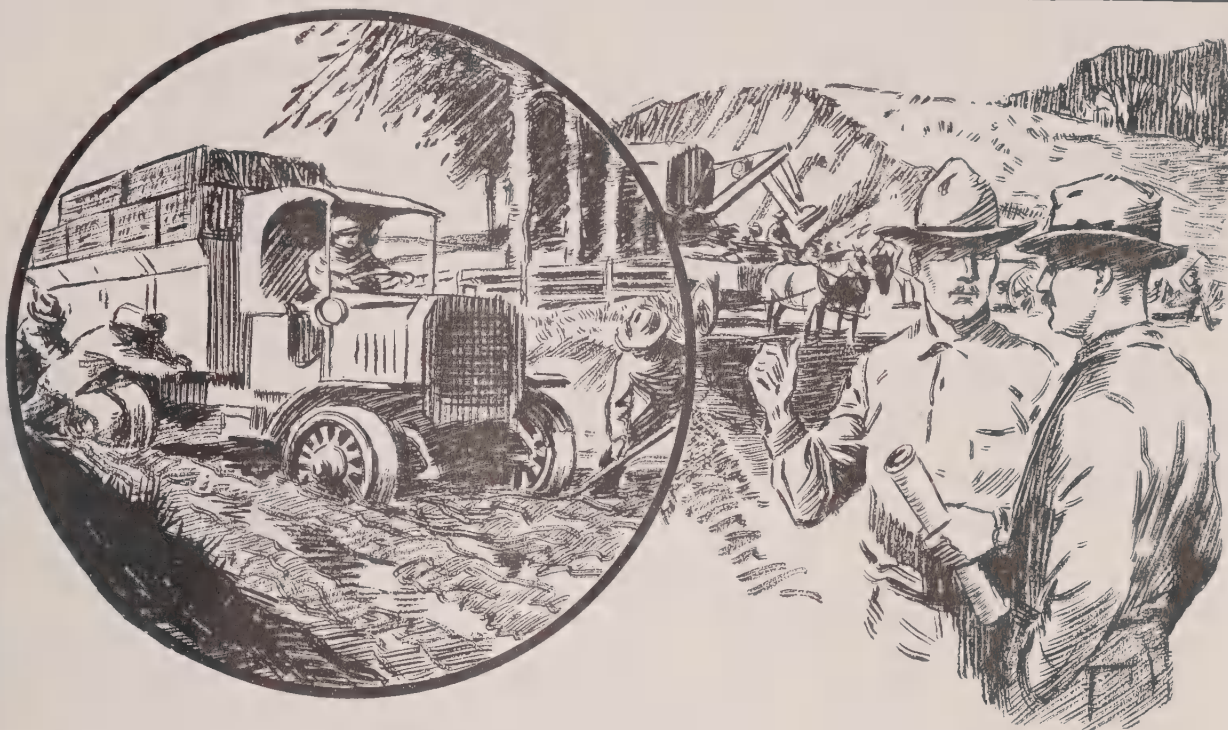


An 18" Diameter "GENUINE OPEN HEARTH IRON" Culvert Pipe in use on the Weldon-Jackson Highway in Northampton County, N. C. Photograph taken Feb. 17, 1916.

THE photograph above gives an excellent idea of the resistance of "Genuine Open Hearth Iron" Culverts to extraordinary wear. It is not often that a Culvert of any type has to withstand the direct wear and tear of the heavy traffic coming in contact with the bare surface, but such is the case in this instance. This Culvert has been in use since the Fall of 1910, and as the picture was taken February 17, 1916, you can readily understand that it must have had rather hard knocks in that length of time. Our Mr. J. H. Slaghter took this photo with a kodak and states that not only was this Culvert exposed in the manner shown, but at least a dozen more on the same road were installed under like conditions and have been subjected to the same rough treatment for the past few years.

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SOUTHERN GOOD ROADS

HIGHWAYS - STREETS - MOTORING

Vol. XXII - I

Lexington, N. C., July, 1920

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SOUTHERN GOOD ROADS PUBLISHING COMPANY
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SOUTHERN GOOD ROADS

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Lexington, N. C., July 1920

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Digest Annual Convention North Carolina Good Roads Association

By MISS H. M. BERRY, Secretary

THE Annual Convention of the North Carolina Good Roads Association, held this year in Asheville, marked the twentieth year of the association's life. Its whole life up to now has been spent under the guidance and direction of its parent, the North Carolina Geological and Economic Survey, having been organized in 1901 by Professor J. A. Holmes, State geologist, and later directed by his successor, Col. Joseph Hyde Pratt. It is only during the past year on the eve of its majority, that the association has assumed any sort of pretentious dimensions as to membership, scope of influence, etc., and become financially able to stand alone. With the growth of its membership during the past nine months from a little less than a hundred and fifty last August to well over four thousand now, the organization begins to feel the possibilities it has for accomplishing for our State that exceedingly vital factor in the State's development—an adequate transportation system. With this idea in view, it was planned by the executive committee last January to install one full time administrative officer to handle the administrative and detailed work of the association and Miss Berry was engaged for this work.

At the Asheville convention, while not so large in attendance as some that have gone before, yet there was shown an exceedingly great interest on the part of those attending in the various problems presented for discussion. The program was full of live topics and excellent speakers and was carried out practically as planned. The papers given at the convention will be published in this magazine from time to time.

Attendance.

There were 218 delegates registered from 45 counties and nine other States, consisting of county commissioners, road commissioners, trustees, etc., road engineers, road superintendents, representatives of chambers of commerce, boards of trade, women's clubs, road machinery and material companies, contractors, members of the legislature and citizens at large interested in the work of the association. It was particularly gratifying to note representatives, and in some cases large numbers, from certain of the mountain and some of the rural eastern counties

which have hitherto not participated in our work, such as Ashe, Clay, Graham, Greene, Jackson, Mitchell, Northampton, Yadkin, Yancey, etc. The fact that these counties, as well as many others, have begun to take sufficient interest in the general road question to send large delegations to a State convention shows conclusively the great growth of the association in extending its influence and spreading its propaganda for a State system of highways and for more systematic and efficient county road work.

Resolutions.

Much of the thought of the convention crystallized around the principles which the association has been advocating for the past year and the following resolutions were adopted:

Whereas, it is believed that the time has come for a more definite and efficient classification of our public highways into National, State and County highways; and

Whereas, it is believed that further legislation is vitally needed to stabilize a State policy for constructing and maintaining such a system of State highways within a reasonable time and built of such types of pavement as will meet traffic conditions; and

Whereas, the counties have shown their willingness to provide ample means for the construction of their systems of highways;

Therefore, be it resolved, That the State of North Carolina should now adopt a policy with reference to its State highway system that will attain at the earliest possible date a system of State highways connecting all county seats and principal towns of the State by hard surfaced roads, to be built and maintained by State and Federal funds, exclusive of county co-operation.

Resolved further, That the State and county authorities be urged to co-operate in the location and establishment of such lateral roads as will lead to the ultimate completion of this State system.

Resolved further, That a sufficient amount of funds from motor license fees be set aside each year for the adequate maintenance of this State highway system.

Resolved further, That the North Carolina Good

Roads Convention ask the legislature in special session in July, 1920, to appoint a commission to draft a comprehensive act to be presented to the legislature of 1921 to provide the ways and means for the construction and maintenance of a modern State system of highways.

Resolved further, That we respectfully request the special session of the legislature of North Carolina to pass an act submitting to the voters of the State at the November election the question of whether or not they favor the construction and maintenance by the State of a modern system of State highways connecting all county seats and principal towns.

Resolved, further, That it is the further sense of the members of the convention that where any county has constructed roads that meet the requirements of the State highway system, there be allotted to that county its pro rata part of State funds for the further construction of other modern highways in said county.

Whereas, it is realized that, with the rapidly increasing motor traffic on our public highways, any



Team Hauling 2,700 Pounds of Lumber, 14 Miles, in North Carolina

vehicles using these highways after dark without showing a light become a danger to all other vehicles using the highway, as well as to the vehicle without a light;

Therefore, be it resolved, That a State-wide law should be passed requiring all vehicles using the public roads of North Carolina after dark to show a light.

Whereas, grade railroad crossings have been the cause of hundreds of deaths during the past year; and

Whereas, many of the more dangerous of these grade crossings could be eliminated without very great expense; and by eliminating such crossings the toll of deaths by railroads could be and would be very materially reduced;

Therefore, be it resolved, That the General Assembly of North Carolina be memorialized to pass adequate legislation which will insure in a certain number of years the removal of these dangerous crossings by making it obligatory upon the railroads and counties where these dangerous grade crossings exist to jointly remove at least one such grade crossing per year in each of such counties.

Whereas, the motor traffic on our public highways

is becoming the principal means of transportation; and

Whereas, at the present time these motor vehicles are paying but little attention to speeding on our improved highways; and

Whereas, many accidents are constantly occurring, due to this selfish use of the roads; and

Whereas, incompetent persons are driving motor vehicles on our public highways endangering not only themselves but all other users of the highways;

Therefore, be it resolved, That, in the interest of all users of the highways, the General Assembly of North Carolina should pass legislation requiring all drivers of motor vehicles to take out a license which would show his fitness and ability to drive a car and that said license would be revoked for a certain number of days if the driver was convicted of speeding; and upon a second conviction the driver would be fined and his license revoked for a period three times as long as the previous period; upon a third conviction his fine would be doubled and his license revoked permanently.

Be it further resolved that any driver who drives a motor car while in a state of intoxication shall be fined, and have his license revoked for a certain number of days; upon second conviction his fine will be doubled and his license revoked for five times as long a period as the first; upon a third conviction his license will be permanently revoked.

Resolved, That the North Carolina Good Roads Association extends its cordial thanks to the citizens of the City of Asheville for their courtesies and hospitality, to the Board and the press for their cooperation; to the county commissioners of Buncombe County.

Mr. John J. George, of Gaston county, discussed the question of making our road and other public improvement bonds tax free and having them approved by the attorney general of the State, an exceedingly vital factor in our State's progress. The following resolution was offered by Mr. George and referred to the executive committee of the association:

Resolved, That it is the sense of this convention that a committee of three members be appointed, and that they be instructed to have prepared such legislation as will allow all bonds issued in this State to be free from State, county or municipal taxation.

2. That all bonds shall be issued on a reasonably assessed valuation that will be fair and just to secure the necessary improvements desired, and that general laws for this purpose be secured from the next regular session of the General Assembly.

3. That all bond issues shall be submitted to the attorney general of the State for his opinion as to the regularity and validity of such bonds, and that his opinion in such matters shall make all such bonds incontestable.

Election of Officers and Amendment of Constitution.

The constitution was amended to make the first and second vice-presidents members of the executive committee. The officers elected for the coming year are as follows:

President, W. A. McGirt, of Wilmington.

1st vice-president, Mr. John Sprunt Hill, Durham.

2nd vice-president, Mr. W. C. Boren, of Pomona.

Secretary, Miss H. M. Berry, of Chapel Hill.

Treasurer, Mr. Jos. G. Brown, of Raleigh.

District vice-presidents:

1st district, Hon. John H. Small, of Washington.

2nd District, R. F. Hill, of Kinston.

3rd district, Thos. O'Berry, of Goldsboro.

4th district, W. A. Wellons, of Smithfield.
 5th district, Bennehan Cameron, of Stagville.
 6th district, O. L. Clark, of Clarkton.
 7th district, W. N. Everett, of Rockingham.
 8th district, J. A. Groves, of Albemarle.
 9th district, S. N. Boyce, of Gastonia.
 10th district, N. Buckner, of Asheville.

Executive committee: Mr. W. A. McGirt, ex-officio, chairman, Wilmington; Miss H. M. Berry, ex-officio secretary, Chapel Hill; Mr. John Sprunt Hill, Durham; Mr. W. C. Boren, Pomona; Mr. H. D. Williams, Kenansville; Mr. P. C. Whitlock, Charlotte; Mr. T. L. Gwyn, Springdale; Mr. Hugh McRae, Wilmington; Dr. Joseph Hyde Pratt, Chapel Hill.

The time and place for the next convention were left to the executive committee.

REPORT OF PRESIDENT W. A. MCGIRT TO NORTH CAROLINA GOOD ROADS ASSO- CIATION AT ASHEVILLE, JUNE 16-18.

SINCE my last annual report your association has increased its membership and its budget to the point where it may be made a militant force and an important factor in the movement for a State system of hard-surfaced highways and local county roads.

Acting upon the recommendation contained in my last annual report a new office of field secretary was created, and definite plans were outlined for an aggressive membership campaign which has already netted wonderful results.

The association now has sufficient man-power and funds to insure carrying the good roads program to a successful conclusion. During the past year your president has held meetings and discussed the subject of State highways at the following places: Goldsboro, Fayetteville, Newbern, Washington, Mt. Olive, Warsaw, Wallace, Bolivia, Town Creek, Rose Hill, Burgaw, Rocky Point, Jacksonville, Hertford, Williamston, Mt. Tabor, Whiteville, Clarkton, Elizabethtown, Council, Abbottsburg, Clinton, and has held conferences at many other points in the State.

Supplementing these meetings and conferences, several thousand letters have been mailed from my office to farmers, merchants, bankers, manufacturers, traveling men, and State and county officials, calling attention to the urgent need of, and suggesting methods for obtaining an adequate system of highways for the State.

Farmers' organizations, boards of trade, chambers of commerce, traveling men, professional men and various other organizations have passed strong resolutions calling on the State to provide adequate legislation for the construction of a system of State highways. The hearty co-operation of the State press has been obtained in publishing scores of news stories and editorials dealing with this important subject.

On behalf of the association, I take pleasure in expressing our appreciation of the many courtesies received at the hands of our State periodicals.

Other organizations working for the same ends have given hearty support to our efforts and it has been a pleasure to have the assistance of the other constructive agencies.

The need of proper transportation facilities was never more acute than now. Relative, if not absolute

famine confronts the world today and production must be stimulated.

Favors National System.

I would respectfully recommend that this association again pass suitable resolutions endorsing a system of National highways connecting States, same to be financed, constructed and maintained by the Federal government without regard to State lines, and that copy of said resolutions be forwarded to Senators Overman and Simmons, and to our congressmen, urging their support to such a measure.

Good roads are a necessary factor in stimulating production and crop movements. The balance between food supply and demand cannot be regulated nor can food supplies be properly conserved until every facility is given the farmer for moving his product.

I am reliably informed that last year's crop of sweet potatoes in this State was valued at \$13,000,000, of which \$6,000,000 was lost to both producer and consumer through lack of transportation and organization.

If this astounding loss took place in only one commodity what must have been the total loss to this State when all crop wastage is considered? It is



What Neglect Will Do for a Sand Clay Road—North Carolina

imperative that farms be kept under cultivation, and to do this we must hold and increase our rural population. This cannot be done until rural conditions are improved, and rural conditions will not improve until we build good roads in all sections.

When farmers of North Carolina are placed in touch with competitive markets, business in the centers of trade will be greatly stimulated, the problem of marketing will be simplified and the balance between supply and demand will be more nearly established.

Almost without exception, new homes, farms, churches, public schools and consolidated schools, and other public buildings follow a good road, to say nothing of increased taxable values, better crops and increased crop production and the elimination of crop waste.

My friends, those of us who have been in close touch with the sentiment of the people in regard to extensive expansion of road construction are convinced that the vast majority of the tax-payers of this State are not only willing, but anxious to support and pay for a system of highways adequate to

the present and rapidly increasing need for better transportation.

If we are right in assuming that there is need and demand for legislation which will meet the situation, then the time has arrived when this association should take the necessary steps to bring the matter to an early and successful conclusion. The people are demanding relief, an aggressive policy on the part of this association at this time would be a powerful factor in giving it to them.

Present Road Law Inadequate.

The present State road law is wholly inadequate to provide for the road needs of the State. You are urged to investigate that law and satisfy yourselves as to how long it will take, operating under its provisions, to build a complete system of State and county highways.

Under the present law, county commissioners must, in order to secure a share of State and Federal aid, build the State highways. Therefore, under this system, your commissioners must neglect the remote sections of your county and concentrate on the main highways. Counties are now so involved that the building of a local system of county roads is almost out of the question, because the county which votes bonds to build the county's share of the State highway will have so far exhausted her revenue resources available for road purposes that she will have nothing left with which to build, in a proper manner, the network of county highways leading to the main or trunk line State highway.

To be of greatest service to the farmer, and through him to the State, the State highways must be made available by a system of high class county roads.

The counties are not able to build both systems.

In the matter of road building, counties of the State are functioning in a splendid manner and the aggregate voted and appropriated the past year or two approximates \$25,000,000. This is indicative of two things: People want good roads and are willing to pay for them.

We are assured that a majority of the members of the General Assembly will consider the important question of passing the necessary legislation to secure a system of State highways commensurate with the needs of the State.

This being true, we should face the future with courage and confidence and immediately press our advantage.

Members of this association are the leaders in the good roads movement in the State, and as I view the matter, it is clearly our duty to take the initiative and the necessary steps to bring this matter to an early and successful conclusion. An investigation of this question will reveal that the taxpayers of the State are overwhelmingly in favor of the State building a system of modern highways connecting all sections. This association should adopt an aggressive policy at once and press the matter to a final conclusion.

In closing this report, I wish to thank members and officers of the association who have worked faithfully and unselfishly for the advancement of the cause and the development of the State.

Garrard county, Kentucky, has broken ground for the Federal Highway that is to pass through that county and now has a large force of men at work.

KENTUCKY ROCK ASPHALT ROAD.

Contract has just been let for resurfacing with Kentucky Rock Asphalt the extension of the famous Eighteenth Street Road at Louisville, Ky., for a distance of 11.1 miles from the end of the present Kentucky Rock Asphalt section to the Jefferson county line.

The rock asphalt section of this road (about seven miles) has aroused nation-wide interest because of the remarkable test which it withstood during the war. At one end of the road was Camp Knox, an artillery encampment. On the other side of the city of Louisville was Camp Taylor and just across the Ohio River at Jeffersonville, Ind., was the great army supply depot. All the heavy traffic between Camp Knox and the two military points, passed over the Eighteenth Street road. A careful estimate showed an average of 4,000 vehicles, most of them trucks, a day (12 hours) for almost two years.

In spite of this severe test, the rock asphalt section of this road is in excellent condition today—there is not even a crack in its surface.

The 11.1 miles extension, which has just been let, is at present a sixteen-foot macadam roadway, surface-treated. The old surface will be lightly scarified and covered with three inches of new metal compacted. On top of this Kentucky Rock Asphalt will be laid cold and compacted to a thickness of two inches. In addition, the roadway will be widened to twenty feet. Specifications call for nine inches of compacted metal and two inches of compacted rock asphalt for the two foot extension on each side of the present roadway.

The road will be relocated for four miles. Grading of this section will be done this year, the surface placed next year. This new construction calls for a nine-inch compacted macadam base and two-inch compacted Kentucky Rock Asphalt top twenty feet wide.

J. H. Cahill, Louisville, Ky., has been awarded the contract for the work.

AUTO MEN WILL POST ROADS.

A \$10,000 sign-posting contract to post all doubtful points in the State of Florida which will start at once were among matters adopted at the third annual convention of the Florida State Automobile Association which met at Ocala. Twenty-six towns and cities were represented. The \$10,000 sign-posting contract will give Florida a uniform system of distance and directing signs, the equal of any in the United States. These signs will be erected wherever needed, regardless of the number of members in the section affected.

Other resolutions adopted were: Favoring State bonds for roads, calling for \$10,000 sign-posting contract and asking county commissioners to pay one-half the cost to the association of the sign-posting actually done in their respective counties.

A permanent highway of asphalt from Raleigh to the Franklin county line by way of Wake Forest to be built by a special bond issue of \$1,000,000 is a new movement launched by advocates of good roads in the northern section of Wake county, North Carolina.

Arkansas Governor on Good Roads

Extract from Address by Gov. Chas. H. Brough at Eighth Annual Convention of the United States Good Roads Association at Hot Springs

In the death of our great president, who for the past seven years has been the guiding genius of this far reaching constructive organization, Senator John H. Bankhead of Alabama, the cause of good roads in the United States has suffered an irreparable loss. Serving bravely for four years in the Confederate army and thrice wounded; representing his native county of Marion in the general assemblies of Alabama for four successive terms; elected to the House of Representatives in the Fiftieth to the Fifty-ninth Congresses; appointed a member of the Inland Waterways Commission March, 1907, serving as one of the Democratic leaders in the U. S. Senate for the past thirteen years, during which time he was the author of as much constructive legislation as any statesman who sat in the world's highest legislative tribunal, Senator Bankhead in the seventy-eight years of his eventful and useful life merits the state-ly eulogy of Senator Conkling upon President Grant, "Great in the Arduous Greatness of Things Done." It was the eternal fitness of things that this far-seeing statesman, who was the author of the Bankhead-Shackleford Law of 1916, under the terms of which \$85,000,000 was made available for the cause of federal aid to good roads and the author of the amendment to the Postoffice Appropriation Bill, whereby \$209,000,000 additional was appropriated for our national highways, and who at the time of his death was a tireless and able co-laborer with Senator Townsend of Michigan, in an effort to secure an additional appropriation of \$600,000,000 available for the five year period beginning in 1921—I say that it was the eternal fitness and a just recognition of his never-to-be-forgotten services in behalf of the construction, maintenance and improvement of our public highways that, "The Grand Old Man of the U. S. Senate should have been chosen as the first president of an association which is destined to have such a wonderful influence on the economic development of the country we so dearly love.

Road Program of Arkansas.

I feel a special pride in the fact that the State which I have the honor to represent has projected the most far-reaching program of public highways in the Union, 9,627 miles, our sister commonwealth of Illinois ranking second with 6,800 miles. The last of approximately \$103,000,000 for the construction two General Assemblies have authorized bond issues of these highways, distributing over approximately 500 district improvement units. Statistics furnished by the Highway Department show that up to date that there have been 4,525 miles let to contract, of which 3,651 are now under construction. The total amount of State and Federal aid funds allotted as aid and already paid on projects amounts to the magnificent sum of \$5,717,933. The Federal Government alone, during the five years period, beginning January 1916 and ending April 1921, has allotted for road building in the State of Arkansas the sum of \$4,640,000. Of the Federal and State aid there has already been paid to date \$1,050,000

Great Highway Prospects.

What Arkansas is doing in the construction, extension and improvement of her highways is typical of the Union as a whole. The United States is entering upon the greatest construction program for highways ever known to any nation at any previous time. During the next five years, there will be at the disposal of the State Highway Departments a grand total of as much as three billion dollars. The program as outlined for the year 1920, looks to the expenditure of approximately \$660,000,000. Twenty-two great national projects including the Bankhead, Albert Pike, Jefferson, Lincoln, Mississippi Valley Scenic, Pershing and Ozark Trails, in which the South and Mississippi Valley are primarily interested, have been projected by the National Government, supplementing the good road building program of our 48 commonwealths and their minor subdivisions. At no time in the history of the world have such vast sums of money been made available for any particular line of work. The greatest era in railroad construction in the U. S. was between the years of 1879 and 1883, and the expenditure was approximately \$800,000,000 for this five year period. During that time 40,000 miles of railroad were constructed at a cost of \$20,000 per mile, estimating the price of labor and engineering material as increasing 100 per cent since 1914, still the actual amount of work to be done with the next five years of road building is far above that which was done during the golden age of railroad construction.

Serious Problems Arise.

Serious problems challenge our consideration and their solution calls for the exercise of forethought, wisdom and prudence. The cost of material has advanced fully 25 per cent in a single year, and in some instances as in bridge tiling quoted at \$33 per lineal foot, as much as 400 per cent. Our bond markets are depressed, due to the congestion of securities. There is a car shortage on practically every railroad in the country of fully 35 per cent. The wear and tear on the roads constructed, due to heavy trucks and motor vehicles, is greater than ever before, necessitating a serious consideration of problems or maintenance. Labor shortage, a seriousness of diverting labor from other needed industries and placing it upon the highway construction of our country, presents complications of no mean magnitude. Road inspection and supervision, practically untouched in this country as yet, should be worked out along scientific and sound economic lines. Ours is the business of broad visioned statesmen, not of politicians and self seekers, who, on the one hand for personal or political vantage, would pursue "a pennywise and pound-foolish economy" and on the other hand, by secret caucuses, legislative legerdemain, excessive profits and fraudulent contracts would fleece our tax payers out of their just and hard earned heritage. Our road commissioners must regard their public offices as public trusts, our engineers must be well trained, thoroughly efficient and honest, our material men must be satisfied with a reasonable profit,

our State Highway Commissions must plan wisely and be like Caesar's wife, above reproach, our maintenance funds must be adequate for annual upkeep and repairs and our inspection systems must be rigid and tireless, if the road builders of the United States expect a continuation of federal aid for the five year period beginning 1921. In my judgment, it is imperative that the 66th Congress continue the great work begun by Senator Bankhead and appropriate a minimum of \$500,000,000 for the five year period from 1921 to 1926 to supplement State and local aid for road building; it is imperative that the beneficent provisions of the Kahn Bill, whereby the surplus war material available for road construction is distributed among the various commonwealths of the Union, be continued for an indefinite period. I believe that this Association should go on record in favor of the passage of a general maintenance and road supervision act by every commonwealth in the Union, and that motor trucks and vehicles of every description utilizing these roads should be taxed for maintenance purposes; and that in no instance should road construction be authorized unless an adequate maintenance fund is provided for either general or special act. It is not equitable that the land owners, largely composed of farmers and citizens often times in moderate circumstances, should be compelled to bear the whole burden of taxation. Personal property should bear its proportion of the

burdens of taxation, especially for maintenance. The antiquated road overseer system should be abolished, and the construction and improvement of all roads should be let out to public contract under a system of competitive bids.

Roads are the veins and arteries, by means of which the circulation of the social body and body politic is carried on. When they are clogged, the march of civilization is retarded. There can be no unity of purpose, no empire of vision in the national brain, no consolidated schools, well attended and well equipped churches and very little commercial development without good roads. All civilized powers have recognized these self-evident truths through the centuries.

Good Highways Not Recognized.

While the United States has not recognized the importance of great National and State highways in the same degree European nations have done, yet good roads advocates have always been found in the councils of our Nation and our respective commonwealths. Henry Clay, one of the trinity of America's greatest orators, was an early advocate of connecting the Atlantic ocean with the Ohio river by a great national pike, and the Cumberland pike commenced in 1806 and built at a cost of \$1,800,000 was a part of that comprehensive program of highways and canals that won for Clay the sobriquet of "The father of public improvements." The famous Santa



A California Good Road Joining a City Street in Los Angeles

Fe' trail, extending from St. Louis to Santa Fe, New Mexico, in the early thirties and forties blazed the paths of the heroic and hardy pioneers of the West. Despite these creditable experiments in material good roads building, the fact is potent that the United States Government and its local subdivisions have wasted millions of dollars in repairing and maintaining poor roads. Measured by every rule of economy, the ordinary roads of our country constitute a poor investment and are the worst in the civilized world. Of approximately 2,500,000 miles of roads of all kinds listed on January 1, 1915, by the Bureau of Public Roads of the U. S. Department of Agriculture, only 140,000 miles were surfaced. In the sixteen Southern States there were only 73,595 miles of surfaced roads at the close of 1914, and by eliminating the sand-clay and gravel, only one-third of these were hard-surfaced with material of the type of concrete, macadam, asphalt and brick. For over a century the United States has expended more in labor and money to carry on a system of inefficient and shiftless road-ways than would be sufficient to keep in proper double length of high-class roads under the methods pursued by European countries.

New Era in Road Building.

With the passage of the Bankhead Road Act in July 1916, a new era in road building was ushered in. This measure, sponsored by the great senator of Alabama, appropriated \$85,000,000 out of the Federal Treasury over a term of five years, to be matched by equal sums from the States for the construction of roads, and provided further that no State should receive any of the money appropriated, unless it had a Highway Department with adequate powers. Despite the fact that the Bankhead-Shackelford Act became a law only a short time before America entered the European War, and its operation was necessarily greatly interfered with by the disturbed conditions, the impetus its passage gave to good roads building surpassed the expectations of even the most Utopian of the good roads enthusiasts and visionaries. When on February 29, 1919, Senator Bankhead, always alert when the cause of good roads was at stake, secured an amendment to the Post-office Appropriation Bill, providing for an additional appropriation of \$209,000,000 for the improvement of rural post roads and forest roads, and when on March 15, 1920, Representative Kahn of California secured the passage of a bill, providing that all surplus war equipment should be transferred to the various States of the Union, amounting to approximately \$200,000,000 worth of trucks, industrial railroads, hoisting machines, concrete mixers, road graders, wheel scrapers, large quantities of powder and high explosives, gasoline, steam water pumps, ambulances, Ford chassis, field ranges, automatic accessories, harness and other road building material, the way was permanently paved even in a reconstruction era for the building of a wonderful system of state and national highways.

Honorable Thos. H. McDonald, the efficient chief of the U. S. Bureau of Public Roads, in a recent forecast says that "It is too early to have definite figures, but it is estimated that the expenditure during 1919 for hard surfaced highways, exclusive of sand-clay and similar types, will total approximately \$138,000,000. The estimated summary of the funds which will be available for highway work during

1920 for the construction of surfaced highways, exclusive of sand-clay and similar types, will total approximately \$138,000,000. The estimated summary of the funds which will be available for highway work during 1920 for the construction of surfaced highways, amounts to the magnificent sum of \$633,000,000."

Alabama, Arkansas, California, Colorado, Georgia, Idaho, Illinois, Maine, Michigan, Montana, Minnesota, Nevada, New Mexico, Oregon, Pennsylvania, South Dakota, Utah, Virginia, Washington, West Virginia and Wyoming have all voted large state and bond issues aggregating approximately \$500,000,000. In those States where State bond issues have either failed, as in Mississippi, Oklahoma and Texas, or where the general assemblies have declined to submit them to the electorate, counties, improvement districts or other minor sub-divisions catching the good roads enthusiasm, have voted bond issues amounting to millions. Mr. MacDonald says that "the most comprehensive and nation-wide good roads campaign ever launched in this country will get under way early in 1920 with the Federal Government



One of Many Fine Roads Around Parkersburg, West Virginia

and every county and State in the Union engaged, and it is expected that the total amount available from all sources for the campaign will reach the billion dollar mark." The Bureau of Public Roads is to be congratulated on the fact that it has outlined a system of highway classifications which is destined to secure a co-ordination of Federal, State and local agencies. The following outstanding features are involved in this program:

First, classification of highways into systems based primarily upon the different classes of traffic, present or prospective, to be carried.

Second, the relative importance of the various classes of highways as to the national, State county and local needs, has modified their sequence and rate of importance.

Third, the correlation and adjustment of highways systems between contiguous localities and States.

Fourth, the distribution of the costs of the improvement of the several systems.

System to Determine Results.

Mr. MacDonald very wisely insists that regardless of the amount of funds made available for use in building roads, the rate of road production will be determined by the resources, transportation, mate-

rials, labor contractor's equipment and engineer's forces that are placed on the work without disrupting other vitally necessary demands for the same resources. He insists very rightly that the production of roads must be studied and programs determined, the same as for any other large industrial undertaking; and in order that the roads which meet the greatest economic needs may receive the first consideration, his department has undertaken the task of a map survey, showing the present national, State and county, or primary and secondary roads, and it is expected that within a year these base maps will be available for all of the States. It is proposed to prepare these State road maps through a co-operative arrangement with the U. S. Geological Survey, which has already submitted maps on a scale of one to 500,000 for all the 13 States in the Union.

In recognizing the incalculable value of federal aid to road building, the necessity of every State in the Union assisting in the financing of roads is becoming more evident each year. Twenty-eight years ago



Shell Pike Between Houston and Galveston, Texas.

New Jersey put into practice the principle that it is the State's duty to assist in the construction and maintenance of the more important roads. Today, every State in the Union, save two, are now following New Jersey's example by contributing money from State funds toward the construction and maintenance of State or State aid roads. These funds have been derived largely from four sources:

- First, special state-wide road taxes;
- Second, legislative appropriations from general or statutory funds;
- Third, State bonds;
- Fourth, automobile revenue.

Auto Taxes for Maintenance.

The laws and limitations contained in the various State constitutions largely determine the manner in which State aid is raised. It is worthy of note that there are 36 of the 48 commonwealths which derived revenues from the registration of automobiles last year, which were used in whole or in part for State construction or maintenance, or both, principally for maintenance. Mr. Eldridge, the director of roads for the American Automobile Association says, "that the best and most equitable form of State taxation

for road purposes would appear to be a State-wide tax levied on all taxable property real and personal, and that automobiles and other road users should bear the cost of maintenance and inspection."

The problem of providing adequate maintenance funds, the very keystone of successful road development, is looming largely on the horizon. If a completed road is not maintained against wear and tear, abrasion and the elements, the pendulum which has swung so swiftly in favor of the good roads movement within recent years will inevitably swing back in the other direction. It is a lamentable fact, universally recognized, that thousands of miles of expensive roads have been constructed and allowed to deteriorate, because neither the local districts nor the States provided adequate maintenance funds. The entire history of road legislation has demonstrated conclusively that it is far more difficult to secure adequate funds for maintenance than for construction. Every truck, motor, vehicle and road user should be taxed according to its horse power, weight and the power of abrasion to support the roads over which they run. The ideal scheme of maintenance would appear to be some compulsory co-operative plan, by which the State could work with the county or local road district, or at least where no state money would be given to any minor subdivision that did not adopt and apply to any completed road a consistent plan of patrol maintenance. I believe that the maintenance and inspection of roads should be vested in State authority in the various State Highway Commissions, giving to the local subdivision the right to determine the method and personnel of the maintenance and inspection work subject to the approval of our State Highway Engineers. Local supervision has proven a failure. Facts and figures—

First, that 85 per cent of the traffic of the country is on the average carried on 15 per cent of the roads,

Second, that probably 30 to 35 per cent of the damage to road surfaces is due to the actual wear and tear, and 60 to 65 per cent of damage is caused by the elements. These statements seem to have no weight whatever with the local authorities. I am aware, of course, that the sacredness of the Decalogue to the Christian, of the Talmud to the Jew, of the Koran to the Mohammedan, of the teachings of Confucius to the Chinese fade into insignificance compared to the devotion of our people generally to the road overseer system. But every delegate present will admit that this system has proven a failure, and we painfully realize that, "New occasions teach new duties, and times make ancient good seem uncouth."

ROAD IMPROVEMENT IN SOUTH.

Road improvement work now going on in Virginia will cost the State and Federal government \$1,892,497, according to figures just made public by the department of agriculture. Federal appropriations will cover 40 per cent of this amount, the rest of the bill being footed by the State.

Road work now in progress in seventeen Southern States amounts to \$23,393,827, the report shows. North Carolina is spending \$1,716,100 on her roads, while South Carolina is shown to be spending the least of any of the seventeen, her figures for road expenditure being \$861,219. Arkansas is spending the most, her figures being over \$4,000,000.

Virginia Starts New Movement

Moving Pictures Will Be Shown of Roads, Good and Bad, Together With Places of Historic and Scenic Interest

A HIGHWAY educational enterprise has been launched in Virginia never before attempted by any State, according to highway officials and others connected with the better road movement. General C. C. Vaughan, Jr., president of the Virginia Good Roads Association, and D. B. Ryland, of Lynchburg, secretary, have contracted for the production of a film to be entitled "Virginia's New Hour," in which an effort will be made to get before the public a complete revaluation of the State in the minds and hearts of the people, and to create a new conception of the highway as a public utility.

The significance of this enterprise, highway authorities say, is nation-wide. Other States have

life—social, religious and educational, taking in all walks of high and low degree.

"One of the fundamental points we are striving for is to turn the tide of youth back to the farm. We realize the magnitude of the task we have assumed, and we hope to set in motion forces that will in due time result in placing a check upon the disproportion between the progress of the fields and that of the cities, between that of industries and that of agriculture. As we see it, the old type of earth road is at the bottom of the trouble, and we hope in the scope we are taking in 'Virginia's New Hour' to bring to the people of Virginia a new and higher conception of what the road means to their prosperity and happiness and to the future development of our State."

The film is being produced under the authorship and personal supervision of James W. Brooks, director of the Educational Bureau, Federal Highway Council, Washington, D. C.

Educational institutions of the States will have a place in the film and student bodies will be asked to take part in staging the dramatic features necessary to a correct portrayal of "Virginia's New Hour." Virginia towns and cities, and also leading industries will appear on the screen as a part of the general plan to show how far the State has advanced in some respects in contrast to a woeful lack of progress on the roads.

Owing to the significance of Virginia's determination to get at the bottom of this bad road trouble, and to present the remedy from the ground up, as it were, reaching out into every phase of the State's social and economic structures, much interest is being taken by government officials whose work has to do with rural development.

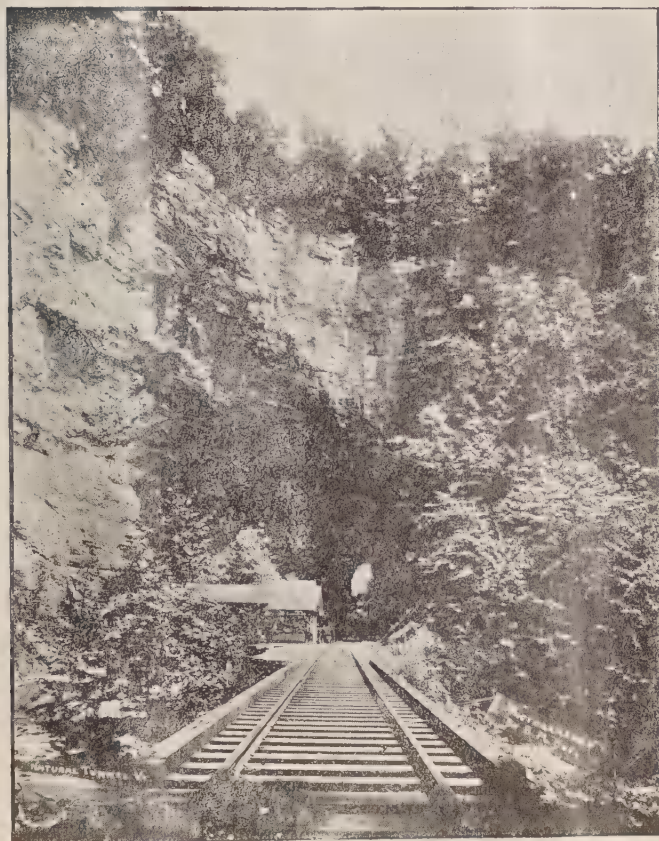
Hon. Edwin T. Meredith, secretary of agriculture, and Hon. T. H. MacDonald, chief of the United States Bureau of Public Roads, are to be among invited guests at the premier showing of "Virginia's New Hour," at Richmond, the date of which will be announced later. The list of invited guests will also include State officials, mayors of Virginia municipalities, and the officials of all civic, commercial and farm organizations throughout the commonwealth.

Places of historic and scenic interest in Virginia will be transferred to the screen as a means of impressing upon the people the fact that millions of dollars will flow into the State annually, once a State-wide system of modern roads is constructed. With this aim in view, an important section of "Virginia's New Hour" will be devoted to "American Shrines Revisited."

The camera's first work will begin on a journey "Down the World Famed Shenandoah Valley in Apple Blossom Time."

The Highway Board at Charleston, Mo., has approved plan for the construction of the Charleston-Bertrand concrete road, which will receive \$180,000 in State and Federal aid.

Valdosta, Georgia, favors a bond issue for good roads.



Natural Tunnel in Virginia. Creek and Railroad Both Go Through Tunnel

taken steps to overhaul their highway laws and their construction and maintenance methods, but it has remained for Virginia to take the lead in one of the most comprehensive and far-reaching studies of the highway and its relation to all walks of life ever undertaken.

"For years," says General Vaughan, "good roads advocates have talked about what better highways will do. In 'Virginia's New Hour' we propose to show the modern road in action, and to demonstrate its beneficial effects, not only upon our commercial and industrial activities, but upon the whole range of

The Laborer is Worthy of His Hire

By E. A. CANNON

Executive Secretary Wisconsin Good Roads Association

IN DISCUSSING the question "the laborer is worthy of his hire," we may look at it from two aspects: the moral and the economic—morally, what compensation is the employer in duty bound to pay to the laborer, and, economically, what is he justified in paying him?

For obvious reasons I shall not enter into a discussion of the moral side of the problem, for, as a practical fact, we are all agreed that the economic side governs in determining the matter. From the moral point of view, we are agreed that no position should pay less than a living wage, sufficient to maintain in comfort and decency the employee and those dependent upon him. That is a truism.

From the economic side, we may lay down as a general proposition at the outset that every position should pay the amount necessary to secure and retain in the service, employees capable of conducting the business with efficiency, initiative and results. That, on the face of it, is a truism in theory, but in practice it is far from it in the matter of highway construction and maintenance, as I shall attempt to show.

At the annual convention of the American Association of Public Highway Officials at Louisville in January of this year, State Engineer A. R. Hirst of Wisconsin, presented the question with compelling force, particularly that aspect of it which referred to State highway officials. He called special attention to the fact that the American people, while always willing to pay the price for the work they desire, have never been willing to pay the price of the proper supervision of it. "Millions for public works, but a pittance for those who must design and supervise the building of them," seems to be the American spirit, according to Mr. Hirst. He dwelt on the fact that the idea seemed to be to get money and more money to build highways without taking into consideration what kind of highways were built, who built them, or whether the people got a dollar's worth, or a dime's worth, for a dollar.

Attention was called to the frequent changes in State highway departments, owing to political reasons. In the matter of salaries, 32 of the 40 States paid a State highway engineer less than \$5,000 a year, and twenty of these men received \$3,600, or less. The average work expected to be supervised by a State highway department is now in few cases less than \$3,000,000 a year and in many States it will run to fifteen, twenty or twenty-five millions a year.

The conditions which prevail in the State highway department are duplicated throughout the States themselves in the counties and other local units through which the State highway department in most instances operates. Even if the conditions complained of in State highway departments (the frequent changes in officials and the meager salaries) were remedied, there would still remain another angle of the situation to be met; and that relates to the local officials in actual charge of highway work. An examination of the conditions in Wisconsin, which reflect those existing in other States, bears

out this assertion. Any analysis of this side of the case naturally resolves itself into four queries:

(1) What salaries do the county highway commissioners receive?

(2) How do these salaries compare with those paid in other occupations?

(3) Have the salary increases kept pace with the increased cost of living?

(4) Have salary increases kept pace with the increased amount of work required of these officials?

Commissioners Underpaid.

In the matter of wages of county highway commissioners, I have before me reports from 59 of the 71 Wisconsin counties, covering the salaries fixed for the year 1920. I have reduced these salaries to the hourly basis, figured on 300 days a year, deducting 52 Sundays, 4 holidays and allotting 9 days for vacations. I assume that the county highway commissioner works 10 hours a day; but he often works 12 to 15 hours.

In 40 of these 59 counties, or 60 per cent of them, the county highway commissioners receive \$2,000 a



Maintenance on a Jefferson County, Texas, Shell Road

year, or less, and my argument shall be based on the commissioners who are paid this amount, as those who are paid above that are receiving approximately an adequate salary.

Less Than the Day Laborer.

Almost 60 per cent of the commissioners receive 66c an hour or less; and 33 per cent receive 60c an hour or less; seventeen of them receive 50c an hour or less. These are the facts regarding salaries. How do they compare with wages in other occupations?

The average wage-scale for laborers in cities in Wisconsin is 57½c an hour. Every county highway commissioner who receives \$1,700 or less, gets less than this—and there are twenty of them, over one-quarter of the total. In the City of Milwaukee the scale fixed by the Common Council for day laborers, beginning January 1, 1920, was 62½c an hour. On June 1st it will be increased to 70c an hour. In one county, a large and prosperous one, in this State, the

county highway commissioner gets \$1,400 a year, or, 46c an hour—less than a day laborer! In seven prosperous counties the commissioners are receiving \$1,400 to \$1,800 a year—day laborer's and less than day laborer's wages!

Spend Huge Sums.

To show the inequity of the situation it may be stated that the scale of wages for painters and paper-hangers in Wisconsin is 75c an hour, plumbers 75c, masons 75c, electrical workers 75c, longshoremen 60c, and bakers 66c.

As a general proposition, it may be stated that 20 per cent of our county commissioners are receiving day laborer's wages or less and 60 per cent less than mechanic's wages!

And the work and the responsibility laid on the shoulders of the average county highway commissioner is not to be compared with that of the day laborer. The latter is given a task, usually with a machine. His operations are largely mechanical, and do not involve a great amount of judgment or discretion. The county highway commissioner has on himself the responsibility of spending up to, say, \$150,000 of the people's money in the year.

C. of L. Jumps 82 Per Cent.

But the question is not wholly one of the money wages paid, it is one also of the value of those wages expressed in their purchasing power. What are the facts of the question from this point of view?

A report issued by the United States Department of Labor states that under present conditions a man with a family requires \$2,200 a year to live. Since June, 1914, the cost of living has gone up 82 per cent—that is, the dollar will purchase 82 per cent less than it did in 1914, or in other words, it takes \$1.82 today to purchase what you could buy for \$1.00 four years ago. This is due to many causes. It is obvious from this that if the salaries have not increased 82 per cent in this period that the commissioner is receiving less wages today than he did six years ago. What are the facts?

In three counties there has been no increase in the salaries of the county highway commissioners in the past six years. In six counties the increase has been 20 per cent. In one county the increase has been 25 per cent. This means that in ten counties, two of them are receiving 82 per cent less pay than they did six years ago; six of them are receiving 62 per cent less, and one 57 per cent less.

In approximately half the counties of the State, the increase has been 50 per cent or less, which means that half of our county highway commissioners are working for less today than they did six years ago—based on the increased cost of living!

Finally, there is another angle to the situation. Are the county highway commissioners required to do a larger amount of work than they previously were? They are! In Wisconsin under the operations of the State Trunk Highway Act, with its patrol maintenance and the increased construction through Federal aid, the labor and responsibility of the county commissioners have been increased 50 per cent.

Taking these last two elements, the increase in the cost of living, and the failure to receive a commensurate raise in wages, and the increase in the amount of work done, are we not driven to the inevitable conclusion that the county highway commissioners are doing more work and receiving less pay?

What is the result of this condition? What will be the result of a condition of this character? Inevitably it will be that the county highway commissioners will have a tendency to quit their positions and to take up more remunerative and less responsible labor; for the dominant factor that determines what men will do is the pay men receive. That is basic human nature, and you can't get away from it.

Someone will say, and I have heard it said, if the county highway commissioner isn't satisfied with his pay, let him quit and we'll get a new one. The man who views the problem from that point of view has little conception of what makes for efficiency in business.

Crudely phrasing it, the county highway commissioner is a combination of ability, industry and experience. Eliminating, say the ability and industry as inherent, his experience is worth money, and the county has paid for it and the county cannot afford



On One of the Maryland State Aid Roads

to lose it. I do not mean to say that there are men who have learned so little in the school of experience as county highway commissioners that they cannot be superseded by others and with good results. As a whole, however, they cannot. If your county highway commissioner is of such a character that you can drop him tomorrow and supersede him by a man who will do as well, you ought to drop him today. I am referring to the vast number of commissioners who have had some years of experience and who you, by your action in re-electing, have approved as competent men.

Every new employee introduced into an establishment and adjusted to his particular place; every new county highway commissioner appointed entails an expense over and above what the continued service of the former employee or county highway commissioner would have cost.



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NO. 1

BIG ROAD DRIVE IN NORTH CAROLINA.

President W. A. McGirt, of the North Carolina Good Roads Association; Col. T. L. Kirkpatrick, former mayor of Charlotte, and other prominent Tar Heels are waging an intensive campaign to have the coming extra session of the North Carolina Legislature, which meets in August, authorize a State bond issue for something like \$50,000,000 for the construction of a Statewide system of hard surfaced highways.

They have already secured the endorsement of a large number of commercial and professional organizations in the State and are still making a drive to pledge members of the General Assembly to their program. The cause is now being taken to the farmers and President McGirt has addressed the following open letters to the farmers of the State:

Gentlemen:

Don't you feel that the time has arrived when the great State of North Carolina should "lift you out of the mud?"

As you well know, the question of transportation is one of the most serious problems before our State and Nation today. The food situation is acute and the lack of transportation facilities is a factor, which, added to the difficulty of increased production, stifles the farmer.

During this period of readjustment and reconstruction, the National, State and County Governments should put into effect a very definite constructive plan to meet the changed conditions and stabilize the affairs of our State and Nation.

Every ounce of constructive work done now will offset tons of Bolshevism and will do much toward quieting the unrest so prevalent in the world today. Large centers of population will never allay the present unrest—our safety rests with the country people, the plain country people. You furnish the fuel for every line of industry and it is the farm that provides all the essentials necessary to life.

Statesmen realize that you are an important factor in the world of commerce, and that it is to you

we look in every crisis to feed the hungry world. Doubtless that is the reason why a few of the far-sighted State and National leaders are giving very careful attention to legislation favorable to rural communities. Improvement in conditions affecting the public health, schools and roads should occupy first place. These things, so essential to the State's welfare and development, have too long been given secondary consideration.

There are candidates in the field today seeking high offices, who are making various pledges as strong bids for the farmer's vote. It remains for you to decide as to whom you think will be most likely to carry out those pledges. You must secure the sort of pledges you deem necessary and support the man whom you are convinced will carry them out. If the average politician was as prompt to fill pledges as he is to make them when seeking an office, we would, within a very few years, have a greater State.

If the State and Nation were ever in need of men with common sense, vision and courage, it is now, and great care should be exercised in the selection of office holders who are to direct the affairs of government for the next two years.

The great State of North Carolina could well afford to invest a small portion of its wealth in a State system of permanent highways, with the knowledge that the improved highways would pay for themselves in the course of a few years.

Almost without exception, new homes, farms, churches, schools and other public buildings follow a good road, to say nothing of increased taxable values, better crops and increased crop production, and the elimination of crop waste.

When farmers of North Carolina are placed in touch with competitive markets, business in the centers of trade will be greatly stimulated, the problem of marketing will be simplified and the balance between supply and demand will be more nearly established.

Present Law Not Sufficient.

The present State Road Law is wholly inadequate to provide for the road needs of the State. You are urged to investigate that law and satisfy yourself as to how long it will take operating under its provisions, to build a complete system of State and county highways.

Under the present law county commissioners must, in order to secure a share of State and Federal aid, build the State highways. Therefore, under this system, your commissioners must neglect the remote sections of your county and concentrate on the main highways. Counties are now so involved that the building of a local system of county roads is almost out of the question, because the county which votes bonds to build the county's share of the State highway will have so far exhausted her revenue resources available for road purposes that she will have nothing left with which to build, in a proper manner, the network of county highways leading to the main or trunk line State highway. To be of greatest service to the farmer, and through him to the State, the State roads must be made available by a system of high class county roads.

Surely the great State of North Carolina is able to finance and construct the main State highways without involving county units. This would relieve the county commissioners of a very heavy burden and enable them to build an adequate local system

of county roads which would serve as feeders to the main highways.

If you would have the State of North Carolina build the main highways without asking aid of the counties and have them built of something more durable than "sand and clay," speak to your State senator and representative and urge prompt action in the matter. Remember, the governor and members of the General Assembly can settle the road question for all time and it is their duty to settle that question in a satisfactory manner by the adoption of a progressive broad-visioned policy in accord with the needs of the State.

If your governmental agents are not willing to undertake the solution of this important problem through the enactment of adequate laws for the construction of a truly "State system" of highways, they should at least submit that matter to a vote of the people.

You are the Government—public officials are agents of the public—If you want a system of State highways and a system of local county roads, you can get them.

Make your Demand now, Today.

MISSING LINK NORTH TO SOUTH.

(By C. H. Van Hervie.)

THE missing link of really good automobile roads connecting the Northern and Middle Western States with the South has been located at last. This new route carries the tourist through the Shenandoah Valley, through Roanoke and on to a point seventeen miles southwest of Pulaski along the Roanoke-Bristol pike, where the highway to Mount Airy, N. C., begins. At this point large signs have been placed to guide the traveller southward over a good macadam road through the Fort Chiswell Farms via Jackson's Ferry, over Poplar Camp Mountains, through historic Hillsville, due south to Mt. Airy, Statesville and Charlotte by way of Fancy Gap. The distance between Pulaski and Statesville is 130 miles and the distance between Roanoke and Mt. Airy is 92 miles.

This route has been pronounced by J. F. Mixer, official pathfinder of the Automobile Blue Book Publishing Company, as being the best route of the South today, over better roads, shorter, straighter, due south from Roanoke to Charlotte, carrying the tourist over the picturesque valleys of Virginia, through sections heretofore very little travelled but vibrant with historical interest. The entire route through the western part of Virginia wends its way through magnificent blue grass pastures, where contented fatted cattle dot the hillsides, reaching at Hillsville in the southwestern corner of Virginia by gradual ascent an elevation of 3,000 feet above sea level.

The moment the tourist has crossed New River at Jackson's Ferry the scenes change. Entering a narrow pass, the road winds up between the mountains by a gradual ascent to the Poplar Camp Mountains, where in the early days of pioneer industry lead, iron and zinc were mined and the salt and lime deposits worked that supplied Virginia and the Carolinas with metals and other needed commodities. It is on these hilltops that the eye beholds the ruins of a greatness of the past; the affluence, the thriving if primitive activities of the pioneer in the many shot-towers that a century ago supplied the South

with shot; and in the stately mansions of yesteryear; now decadent. It is here that history was written on the face of the mountains by Morgan, Phil Sheridan, Jubal Early and Stonewall Jackson. Here was the home of intrepid Colonel Moseby and the first Rough Riders, who as raiders became a terror during the Civil War.

By the Allen Home.

Beyond Poplar Camp Mountain the road continues straight south into Hillsville, an old settlement and the county seat of Carroll county. It was here that eight years ago the Allen Clan made their last fight against constituted authority, father and son preferring death to incarceration. The story of the Allens is too well known to need repetition here. Suffice it to say that in the battle at the court house at Hillsville Sheriff Webb, Judge Massey, Prosecuting Attorney Foster and a witness, Miss Ayers, were killed and several others wounded who ultimately recovered. Floyd Allen and his son Claude were electrocuted in 1913 at Richmond for this crime and Sidney Allen, whose beautiful estate on the crest of the Blue Ridge south of Hillsville is rapidly falling into decay, is serving a 35-year sentence in the penitentiary.

The road from here continues straight south past Mitchell's Hotel and gradually descends by easy grades through Fancy Gap, unexcelled in America for beauty of scenery and expanse of panorama. This road was first surveyed by Jim Mitchell, a civil engineer living at what is now called Mitchell's Hotel, and built by the State of Virginia over a century ago to afford an outlet south for the wealth of metals mined on these picturesque hillsides. From here the traveller can see Mt. Airy, nestling among the hills 14 miles away, and far beyond the town the cone of Pilot Mountain rises majestically two thousand feet above the landscape, an eternal guard and pilot. Further west and beyond the valleys stretch the Blowing Rock country, Grandfather and other noted mountain peaks, which are plainly visible, and right at hand is Devil's Den, one of the strangest freaks of nature in the United States. Far below the road the valleys are dotted with peach and apple orchards, amply watered by numerous mountain streams cascading down precipitous heights. Between Hillsville and the beginning of Fancy Gap is the divide of waters, emptying either to the east into the Atlantic Ocean and west to the tributaries of the Mississippi River.

Into the Piedmont Section.

As the tourist nears the lower levels the vista broadens into fertile acres of wheat, cabbage or tobacco, with immense apple orchards crowning the hilltops and steeper declivities. Here we arrive at the Piedmont section of North Carolina, where Nature has indeed been lavish with her favors in a delightful climate, fruitful soil and charming scenery.

It is amid these natural splendors that the old Allen homestead, a primitive house of rough hewn logs, still stands, defying the tooth of time. And in the nearby family plot the sympathizers of the Allen clan have erected a marble shaft to the memory of the Allens, bearing the inscription that father and son were judicially murdered by the State in defense of their family.

Five short miles south of the State line lies Mount Airy, the Granite City, and one of the oldest towns

in Western North Carolina. Mount Airy is far famed for its many mineral springs, for its granite which has been the material for the really immortal monuments of this country. From New York to San Francisco, from Canada to Key West the most enduring monuments are made of Mount Airy granite. Mount Airy is still the one street town of a century ago, although on its contiguous streets are found some of the most modern garages in the United States, built of granite and steel. Among the early settlers of Mount Airy were the Wright, Gilmer, Banner, Faulkner, Prather, Moore and Brower families, names to conjure with in the history of the Tar Heel State. Foremost among the newer generations was Dr. Joseph Hollingsworth, who practiced medicine on these hills and mountains from 1841 to 1887.

This route has been considerably improved and will shortly be hard-surfaced through all of Carroll county, Virginia, and into the city of Mount Airy. Splendid sand clay highways south from this point through Surry county to the Yadkin River and beyond to Statesville bring the traveller to existing published routes which carry the automobiles to the play grounds of Western North Carolina or straight south through Charlotte to Florida.

AN IMPROVED EXPANSION JOINT.

Information comes from The Macon, Georgia, Telegraph of a very interesting and effective plan for placing expansion joints in cement or concrete paving in certain counties of the State of Washington. The expansion joint in Georgia, says The Telegraph, is the abomination of the vehicle user, causing wear and tear in large percentage, and possibly unnecessarily, in the light of the Washington plan. This idea is to make the joint lie across the pavement at an angle of 45 degrees, instead of straight across, as is the custom here.

Users of wagons, buggies and automobiles know the great jolt and shock which comes from any break or gully lying directly across the road so that two wheels strike it at the same time, however slight the break may be. According to the Georgia paper, the Washington plan obviates this by bringing into contact with the break only one wheel at a time.

It is also stated that the Western authorities and engineers have devised a very unique expansion joint which keeps in the tar, preventing it from being picked out by vehicles and smeared over the face of the road. It would seem to be the proper thing for Georgia road-builders to write the Washington State Highway Department for details in regard to these improvements over prevailing methods in Georgia.

Continuance of the present plan for development of good roads by joint appropriations by the government and the states was advocated last month in Washington before the Senate Postoffice Committee by representatives of highway commission of 12 states, including Texas and Oklahoma. They opposed the Townsend bill proposing creation of a federal highways commission.

Contracts for the construction of 7 $\frac{1}{2}$ miles of roadway in Shelby county and 11 $\frac{3}{4}$ miles in Lauderdale county, Tennessee, were awarded by the State Highway Commission.

\$2,000,000,000 FOR HIGHWAYS.

Plans already made for highway construction indicate an expenditure of \$2,000,000,000 on road improvements in the United States in the next ten years, Leland J. Henderson, secretary-treasurer of the Dixie-Overland Highway Association and secretary of the Columbus (Ga.) Chamber of Commerce, addressing an annual session of Southern Secretaries' Association, at New Orleans, declared recently.

He said good roads offer the chief means of the solution of the nation's future transportation problems and will reduce unrest by facilitating communication and making possible better understanding and more even distribution of products.

GOOD ROADS NOTES IN BRIEF.

The present plans are to let the contracts for the construction of the entire Dixie Bee Line by August, 1920, according to a news item from Madison, Kentucky.

The attorney general at Austin, Texas, approved a bond issue for Shelby county road district No. 4, in the sum of \$300,000 and district No. 7 in the sum of \$50,000, both serials, and a bond issue of \$25,000 for the water work extension.

The movement that was launched at Sheffield, Alabama, by the Sheffield-Muscle Shoals Club late last year to build a concrete highway between Tusculumbia, Sheffield and Florence, has been revived by the Sheffield Muscle Shoals Chamber of Commerce and definite plans are being worked out for the building of the projected boulevard.

Unicoi county court, Tennessee, has voted \$100,000 for the construction of the Bristol to Asheville highway passing through the county. The State and Federal Government will participate by giving \$100,000 each.

A bond issue is proposed in Florida to build the Dixie highway and state road No. 5 in Marion county.

The election held for the issuing of \$192,000 in bonds for the purpose of building roads and bridges in Girard county, Kentucky, carried.

The highway commission, at Knoxville, Tennessee, has requested the issuance of roads bonds not to exceed \$2,500,000 annually.

Rhea county court, Tennessee, will be called upon to vote on an issue of \$600,000 good road bonds.

Survey of the Memphis to Bristol, Tennessee, highway between Jackson and Brownsville is now under way as the initial step for a hard surfaced road to be constructed over the proposed route.

The frequent rains and high winds have washed out and blown away many of the bridges in Saline county, Missouri. The damage is estimated at \$200,000.

One of the provisions of the new Kentucky road law is that if a county wants to make roads now and not wait for the State work is to issue bonds to go to work in from the commission that it is ready to start work.

Judge Cage, New Orleans, Louisiana, denied an injunction against the Hammond highway project, and imposed an additional bond of \$130,200 to cover any losses to the highway department through the delay to the Hammond roadway work occasioned through the carrying of an appeal to higher court.

Roads and Civilization

By MISS ALMA RITTENBERRY

ROADS are an important part of civilization. The first method of intercommunication and traffic between the aboriginal tribes was by means of rude paths and trails, up hill and down dale, just as wild beasts traveled from time immemorial. The introduction of pack animals did not necessitate any material change in the "road," which ran at random, except as travelers sought the easiest transit—the way of least resistance. No care was given to these paths either as regards surface or foundation, and the impact of the feet of man and beast accomplished all that was done to harden the surface.

Volumes could be written on the history and romance of the roads and trails in America in the early days. One of the oldest is the Santa Fe trail, the beginning of which was in 1540, when Francisco Vasquez de Coronado led an expedition of exploration and conquest from Mexico up into Kansas. In 1596 Santa Fe de San Francisco (the true city of the Holy Faith of St. Francis) was founded in a plain rimmed in by mountains, where the Spaniards and Mexicans slept for two centuries, between wars with the Indians.

In the first years of the nineteenth century the American trapper and trader began to disturb the peaceful dreams of Santa Fe. Its authorities tolerated the trapper because their own people did not know how to trap and because there was usually an opportunity to throw the trapper into prison as a spy and seize his belongings.

Traders Open New Route.

But the American trader of those days, like the traditional Yankee, was not to be deterred by considerations of boundaries, diplomacy, or the unfriendly attitude of officials. By 1821 such famous traders as Glenn, Beckwell and Stephen Cooper had made successful expeditions to Santa Fe. By 1824 the first wagon trains had left Independence, Mo. Thereafter there was a rushing business along the Santa Fe trail. In 1825 the trail was made an authorized road by act of Congress. In the next two years it was surveyed and marked out from the western frontier of Missouri, near Fort Osage to San Fernando de Zaos, near Santa Fe. Fort Leavenworth was established to give military protection to the hazardous trade with the Southwest.

Most intelligent Americans know of the old trail, but very few know just where it ran. "It wound through strange, seared hills, down canyons lone, where wild things screamed, with winds for company; its milestones were the bones of pioneers."

By the time General Kearney had taken formal session of Santa Fe, in 1842, in the name of the United States, the road's northern terminus was Kansas City, to which merchandise from the East and South was shipped by steamboat up the Missouri.

The Santa Fe trail began at Westport (now Kansas City) and followed the Kaw river to Lawrence, whence it wound through the hills to Burlingame and Council Grove, the Arkansas valley being touched at Fort Zerah (now Great Bend). The trail kept up this valley to Brent's Fort, now Los Animas, and

climbed the mountains through Baton Pass. There was a short cut from Fort Dodge to Las Vegas, along the Cimarron river. In these days the Atchison Topeka and Santa Fe practically follows this trail.

In 1907 each school child in the Sunflower State was asked to contribute a penny to a fund to buy markers for the famous old trail, and 369,166 responded.

A Famous New York Road.

In New York the terminus of the stage line was at Courtland street, near Broadway. The broad fields and well kept orchards that lined the highway then have been cut up by the streets and built upon. The cosy farm houses and suburban villas are gone, or, like the Jumel and Hamilton mansions, stand walled in by solid blocks of brick and stone.

Just below Tarrytown, at the end of a narrow street or lane running down to the river, stands "Sunnyside," the home of Washington Irving, an old



Restful Scene on Fine New Alabama Highway

house rich in memories of that quaint life and people he has written of so charmingly.

All about the village are objects that remind one of the gifted author. Here is Sleepy Hollow, with the quiet stream which the Indians called "Po-can-to-co," run between the hills, still splashing over the dam by the old mill; and here is the church where the luckless Ichabod Crane led the choir on Sundays, and beside it the graveyard whence the "headless horseman" rode nightly in quest of his lost skull.

The turnpike keeps along the river, a fashionable drive for the residents of the handsome villas; while the other road, following an early Indian trail, runs through valleys parallel with the Hudson, but from two to six miles to the eastward.

The trail through the Highlands was first utilized by Lord London, in command of the British forces.

A few miles above Peekskill there is a landmark that bears unmistakable signs of age. It is a deserted house, the last one of the little settlement made early in the last century, and still known as the Continental Village. The importance of the position at the main entrance to the Highlands, was appre-

ciated by the Americans early in the struggle for independence.

Scattered along the post road at irregular intervals are many of the old milestones. They are moss-grown and discolored with age, and the lettering is almost effaced; yet they hold themselves erect like war-scarred veterans and do their duty as faithfully as in the days when weary passengers looked for them from the coach windows.

All this region possesses historic interest. Even traces of the earthwork of the fortified places of Revolutionary days are to be seen.

Nothing better than a leisurly trip in the autumn over this charming road could be imagined. It is a



Dixie Highway Entering Miami, Fla., Showing Beautiful Australian Pines

poem—a pastoral that runs on with new delight in every line, mile after mile. The ugliness of stone walls and “worm fences” is hidden by ivy and grape vines; golden rod and purple asters nod from the banks and fleets of yellow-winged butterflies sail along the wagon tracks or moor themselves by the mud holes in the ditches. The trees of the orchards bend beneath the weight of ripening fruit. The elms and willows join hands along the water courses; and always to the westward, completing with their perfect outlines the harmony of the landscape, are the Catskills. In the morning with mists drifting up their sides, in the haze of midday and afternoon, and

at sunset, when their peaks purpled and darkened and faded until one by one the stars peep over their summits—always they are beautiful. The Indians called them “On-ti-o-ra” (mountains of the sky).

The Wilderness Trail.

“Some to endure, and many to quail,
Some to conquer, and many to fail,
Toiling over the Wilderness trail.”

They came from France where the Huguenot tired of the persecutions of the land of his birth; from the north of Ireland where sojourned for a time a people who had left Scotland during the time of James Knox and Mary Stuart; from England to escape an unjust taxation in support of the crown; across the broad Atlantic on through the Carolinas, resting for a while on the banks of the lonely Yadkin river, with its smooth waters flowing through the virgin forest.

The years following 1755 were stirring times for these immigrants and refugees who came over to settle in the colonies. There were signs in the political heavens of tremendous changes approaching. There was war between England and France; there was strife along the frontier, where the Indians fought fiercely against the advancing army of civilization, and the spirit of resistance to the tyranny of the mother country was growing rapidly among the sturdy colonists.

The unrest and disturbance was anything but pleasing to Daniel Boone, one of the colonists, who saw the country settling rapidly around, and who began to look toward the West with the “longing which comes over the bird when it gazes yearningly out from the bars of its cage at the green fields, cool woods, and enchanting landscapes in which its companions are singing and reveling with delight.” It was Boone, the born pioneer, who blazed the way beyond the Carolina frontier through boundless forests which stretch for miles toward the setting sun, in which swarmed countless multitudes of wild animals and still wilder beings, who were ready to dispute every inch of advance made by the white settlers.

The Nolichucky trace led through the Waxhaw settlement on the Catawba river, the birthplace of Andrew Jackson and James K. Polk, on across the “Blue Wall.” Through Cumberland Gap, the road is called the Harrowgate Road and leads on to Harrodstown in Kentucky. Boone went through this gap in 1769. He was accompanied by Samuel Callaway, a relative, and the ancestor of many of the Callaways of Tennessee, Kentucky and Missouri. The latter was at the side of Boone when approaching a spur of the Cumberland Mountains, upon whose slopes they saw great herds of bison grazing, the great pioneer paused, and surveying the scene for a moment, exclaimed with kindling eyes:

“I am richer than he who owned the cattle on a thousand hills, for I own the wild beasts of a thousand valleys.”

Kentucky was peopled through the “Wilderness Road” that went through Cumberland Gap by followers of Boone, and as you ride along the road today you can see how the teams of successive immigrants have worn down the old road several feet below its original level. But this immigration passed over the gap, leaving it as lonely as any other mountain pass.

In 1888 the American association built down the mountain side, the town of Middlesborough, spending some twenty-six millions of English dollars, build-

ing the K. O. G. & L. R. R. and tunneling Cumberland Gap over which passed Boone, the great typical character of the age and region, one hundred and nineteen years before. His name is interwoven with the history of Kentucky, the "Dark and Bloody Ground" and with the settlement of the West.

Colonel Richard Henderson, of North Carolina, formed in 1775 an association known as Colonel Richard Henderson's Company, one of the most extraordinary that was ever engaged in opening up our Western territory.

It was over this trail that General George Rogers Clark, the "Hannibal of the West," and his brave followers passed a few years later fighting their way at every step until he "stood in the center of the square, under the flag to whose renown he had added three stars."

There in the miry square within the Vincennes Fort, thin and bronzed and travel-stained, were the men who had dared the wilderness in its ugliest



Flemingburg and Poplar Springs Road, Fleming County, Ky.

nood. And yet no one by himself would have done t—each had come here compelled by a spirit stronger than his own, by a master mind that laughed at he body and its ailments.

The descendants of those who followed Boone into he scenes he had lived so long amidst, and Clark, who was like Hannibal in conquering the foe, and like vanhoe in his love for chivalrous deeds, have built mighty empire between the "Blue Wall" and Rocky ountains.

Natchez Trace.

None the less famous is the "Natchez Trace," called by the backwoodsmen, the Old Notchy Trace (oad) or the Jackson Military Road.

When the war broke out with England in 1812, ackson was the general of the militia in Tennessee. n October Governor Blount was asked to send one ousand five hundred men to New Orleans. On anuary 7, 1813, the infantry embarked in boats to atchez, and the cavalry marched across the couny, through the southern portion of the State, ough north Alabama into Mississippi. No use as made of this force and in the spring it returned Nashville.

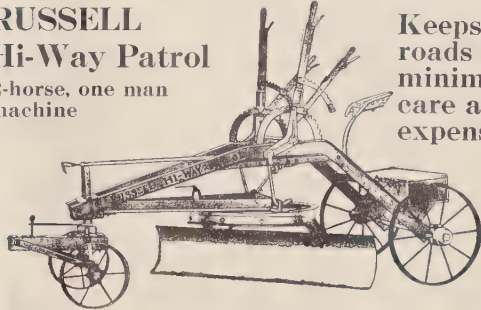
While on the march from Natchez to Nashville the ldiers called their general "Hickory" on account of s toughness. In later years he was called "Old ickory," and hickory poles and trees abounded in

his campaign for the presidency, and at the celebra- tion of his victory at New Orleans. So identified with this symbol of his toughness, that an old man who was a Democratic boy in his time, cannot see a hickory tree without being reminded of Jackson.

This old military road that he had his soldiers cut through the virgin wilderness, bridging rivers and lagoons fringed by that weird parasite that has neither beginning nor end—the gray moss that sways in the breeze from the limbs of umbrageous trees, exposed to the weather, often hungry and thirsty, is a monument to his intrepid courage and tenacity of purpose.

When letters were sent to Governor Blount at Nashville, conveying intelligence of the massacre of Fort Mims, August 30, 1813, and craving assistance, they created great excitement and many Tennesseans volunteered their services in avenging the outrage. Jackson mobilized the volunteers at Fayetteville, Tenn., and at the head of a large force passed through Huntsville, Ala., about the middle of October, 1813, crossed the Tennessee River at Ditto's

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Landing and joined General Coffee, who had been dispatched in advance and who had encamped opposite the upper end of an island on the south side of the river, three miles above the landing. Jackson with his men marched on to Fort Deposit, and from there he cut his way with great difficulty over the mountains to Will's Creek, where, being out of bread, he encamped several days to allow his foraging parties to collect provisions. The contractors had entirely failed to meet their engagements and his army had for some days been in a perishing condition. Jackson and his men suffered many hardships during his campaign. The winter was severe and rations short, but he kept on forcing his way. He made his way over the Coosa mountains, and November 8th he encamped within six miles of Talladega. Next morning the battle of Talladega was fought. March 24 he opened a passage across the ridge which divides the Coosa and Tallapoosa, and on March 27 the memorable battle of Horse Shoe Bend was fought, which ended the Creek war and put an end to Indian savagery and interference in Alabama through the unerring aim of his Tennessee marksmen.

"Old Hickory" A Conqueror.

What few Indians were left fled. Prevented from pursuing the enemy by a flood of the river and the scarcity of provisions, Jackson marched to the head of the peninsula formed by the confluence of the Coosa and Tallapoosa and planted his colors upon the spot where Governor Bienville, 100 years before, had erected Fort Toulouse, so long garrisoned by French troops. Here the rivers approach within 600 yards of each other, and diverging, unite four miles below.

A few of the surviving Indians came in and surrendered, while the larger portion of the few survivors escaped to Florida. The old French trenches were cleaned out and an American stockade with block houses was erected upon the site, which received the name of Fort Jackson.

General Pickney, arriving at Fort Jackson and being the senior officer of the Southern army, assumed command April 20, and approved all of the acts of Jackson. Learning that the Indians were submitting, he ordered the Tennessee troops to march home. Two hours after the orders were issued they were in motion, and were discharged at Camp Blount, near Fayetteville, after a feeling address by Jackson. He then repaired to the Hermitage, from which he had been about 18 months, in a hostile land,

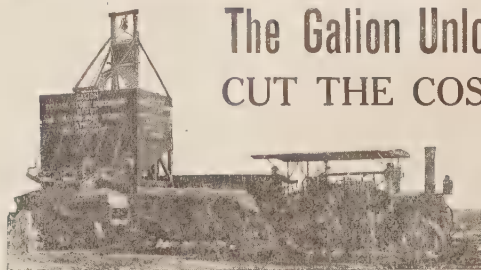
and a portion of the time alone. Jackson was soon to be promoted to the rank of major general.

Called Back to Service.

Leaving the Hermitage once more he proceeded with a small escort to Fort Jackson, where he safely arrived July 10, 1814, and assumed command of the army. He had been empowered to conclude a treaty of peace with the Creek nation. After much opposition from the Big Warrior and other chiefs to the surrender of the territory, which was demanded, a treaty was signed. It was stipulated that a line should commence upon the Coosa at the southern boundary of the Cherokee nation and continue down that river to Wetumpka, and thence eastwardly to Georgia. East and north of that line, containing upwards of 150,000 square miles, remained to the Indians, west and south of it was secured to the United States as indemnification for the expenses incurred by the government in prosecuting the war. In the meantime General Jackson had been vigilant as to the movements of the British and their Indian allies upon the coast of Florida. On August 11, 1814, Jackson departed down the Alabama in boats, with a portion of his troops and arriving at Mobile, made that place his headquarters. He had been advised that it was the design of the English to attack that city soon. The attack upon Mobile Point which had been garrisoned, was a confirmation of the previous conjecture of General Jackson, and he determined to throw a force into Pensacola sufficient to expel the enemy, and had sailed to that place after their defeat at Mobile, but as to his Pensacola campaign, as Kipling would say, "that is another story." On November 9, he took up his march for New Orleans, which was demanding his services, by tedious land transportation, and went first to Fort Montgomery, and thence to New Orleans.

In passing over this portion of the Creek war we cannot refrain from quoting Pickett's tribute to the Creeks:

"Brave natives of Alabama! to defend that soil where the Great Spirit gave you birth, you sacrificed your peaceful savage pursuits! You fought the invaders until more than half your warriors were slain! The remnant of your warlike race lives in the distant Arkansas. You have been forced to quit one of the finest regions upon earth, which is now occupied by Americans. Will they, in some dark hour when Alabama is invaded, defend this soil as bravely and as enduringly as you have done? Posterity may



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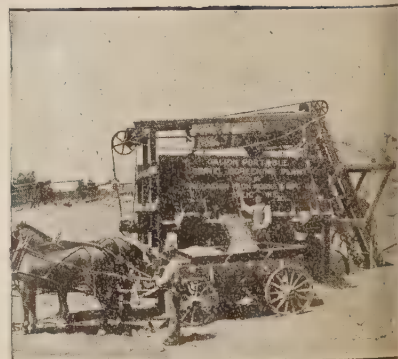
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be able to reply." And history replies, "They did."

Jackson landed in New Orleans December 24, 1814, in command of the American forces, where was fought the memorable battle of New Orleans, January 8, 1815, which settled for all time English domination and interference in American affairs.

A Memorial Highway.

A movement was launched in 1911 to build a trans-continental highway connecting the Lakes and the Gulf coming down through the Mighty Empire between the Blue Wall and the Rocky Mountains as a monument to Andrew Jackson, who laid open to civilization the territory that Boone and Clark blazed a way from Virginia and the Carolinas into the States that border the Father of Waters, the Mississippi. Much publicity was given to the work under the auspices of the Daughters of 1812, but when the Jackson Highway Association was formed to give a more concerted action to the movement an ill-directed pressure was brought to bear on the directors, which changed the route of the highway as first designated, also the purpose for which the work was launched, thereby losing to the memory of Andrew Jackson a national highway of equal importance as the Lincoln Highway. Bancroft says of Jackson:

"Himself the witness of the restlessness of savage life, he planned the removal of Indian tribes beyond the limits of the organized States; and it is the result of his determined policy that the region east of the Mississippi has been transferred to the exclusive possession of cultivated man.

"A pupil of the wilderness, his heart was with the pioneers of American life towards the setting sun. No American statesman has ever embraced within his affections a scheme so liberal for the emigrants as that of Jackson. He longed to secure to them, not pre-emption rights only, but more than pre-emption rights. He longed to invite labor to take possession of the unoccupied fields without money and without price; with no obligation except the perpetual devotion of itself by allegiance to its country. Under the beneficent influence of his opinions, the sons of misfortune, the children of adventure, find their way to the uncultivated West. There in some wilderness glade, or in the thick forest of the fertile plain, or where the prairies most sparkle with flowers, they, like the wild bee which sets them the example of industry, may choose their home, mark the extent of their possessions, by driving stakes, or blazing trees, shelter their log cabin with the boughs and turf, and teach the virgin soil to yield itself to the ploughshare. Theirs shall be the soil; theirs the beautiful farms which they teach to be productive. His heart was ever with the pioneer, his policy ever favored the diffusion of independent freeholds throughout the laboring classes of our land."

A National Highway. A Jackson Highway, splitting the "Middle Basin" between the "Blue Wall" and the Rockies, connecting the Lakes and the Gulf would have been a fitting monument to Andrew Jackson.

The North and South Bee Line Highway adopted the discarded route and it will be the "Middle Basin" National Highway.

Roads Famous in War.

In Tennessee, Kentucky and Virginia the turnpikes are famous in history and story. The Nashville pike from Columbia, through "the garden spot of the world" that Buell made up the hours that



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saved Grant's army at Pittsburg Landing that Sunday night on the sixth of April, 1862, which made Grant a President instead of a prisoner and welded two sections into one glorious nation. "On what little things do the destiny of men and nations seem to hang." A pike of battles it is, and every mile a battleground. Here for four long days blue and gray charged and recharged, captured and recaptured—Van Dorn, Forrest, Wheeler, Hood, Wilson, Buell, Schofield, Thomas, marching and counter-marching on a long, white road of death.

Here it was on that fateful November day ere night had dropped her curtain down, that Cleburne, Strahl, Granbury, Adams and Gist, that matchless quintette of brave generals, lay dead around the breastworks of Franklin while thousands of the boys in gray who marched that day along this shaded avenue, and thousands of those in blue, who fell back before them, gave up their lives.

A most picturesque as well as most historic pike in Kentucky runs from Bardstown, following the old "Wilderness Trail" to Springfield and on to Cumberland Gap. It is one of the first turnpikes built in Kentucky and has been in operation nearly sixty years. Over this pike which gracefully winds around the valley Bragg's arm ymarched in 1862, to engage in the memorable battle of Perryville. Along this pike, too, Quantrell and his famous band of guerillas galloped one winter's day in 1863, to the Griggsby homestead and mercilessly slew three Federal officers who were being entertained there. On this pike is "Federal Hill," the home for years of Judge John Rowan, a man famous in his day as a great political power. It was here that Stephen C. Foster composed

and wrote the world renowned song, "My Old Kentucky Home," while a guest of Judge Rowan. Henry Clay and other notables were also frequent visitors at "Federal Hill." It was on this pike that John Uri Loyd laid the scene of his plot, "Springtown on the Pike," and James Lane Allen has added to its fame by his pen.

If every ripple of the Shenandoah River in Virginia could whisper eac hone could chronicle an historic event, and so could each hoofbeat on those beautiful highways that skirt its banks.

The County Court of McMinn county, Tennessee, has gone on record as favoring the building of its link of the Knoxville-Chattanooga Highway. This highway follows the Southern railway being the same as the Dixie Highway from Knoxville to Lenoir City, thence going through Loudon, Sweetwater, Athens, and Cleveland into Chattanooga, and is an approved state and federal aid trunk line.

L. L. Hardin, George L. Baker and J. Pope Matthews, all Columbia, South Carolina, bankers, have received their commissions from Governor Cooper as members of the commission on the two million dollar Richland county permanent roads bond issue.

The proposed Federal Highway through Hart, Green, Taylor, Marion, Boyle, Garrard and Madison counties, Kentucky, was assured when Garrard county voted in favor of issuing bonds to raise money with which to pay the county's part of the costs of the road.

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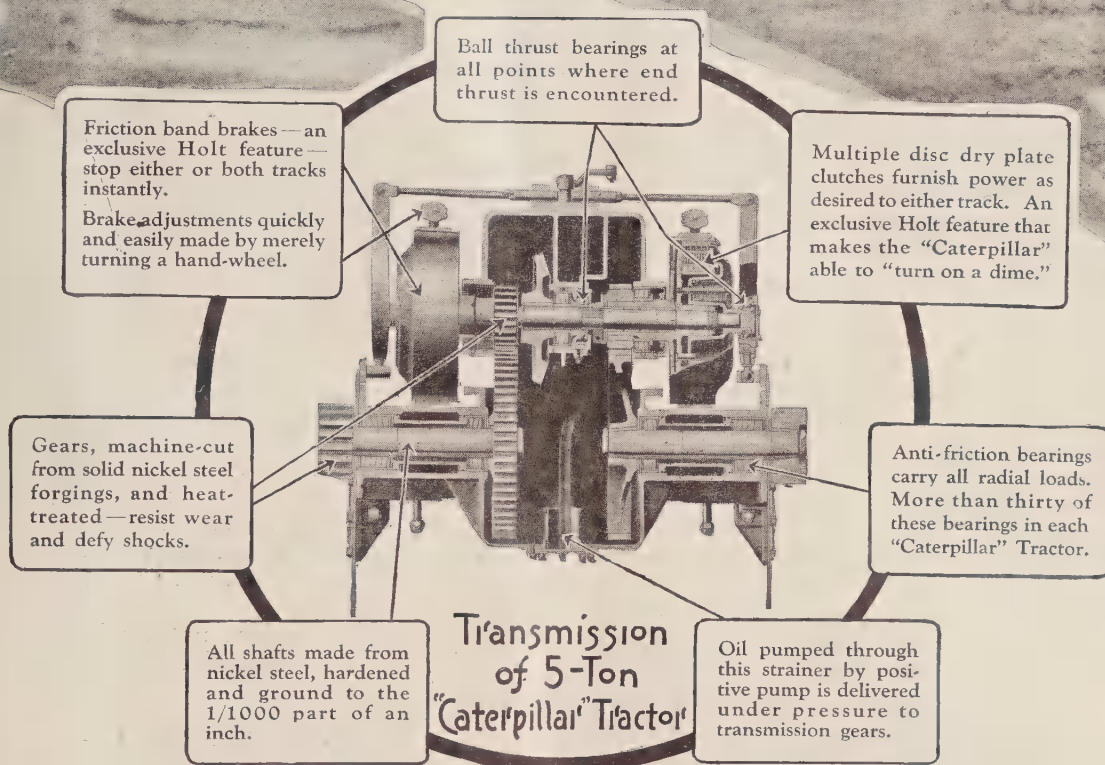
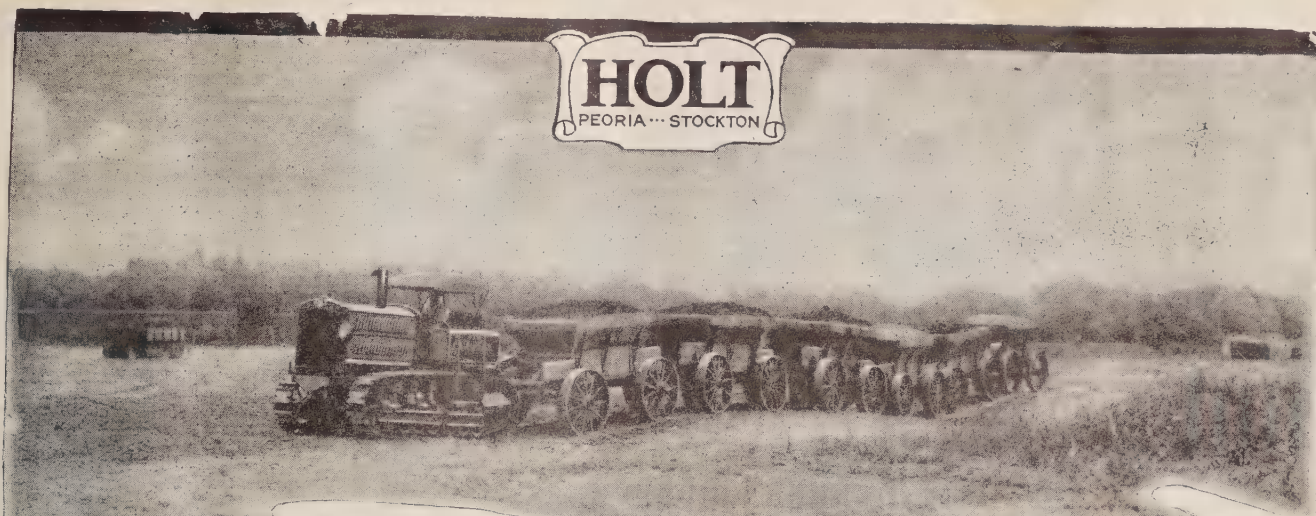
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SOUTHERN GOOD ROADS

HIGHWAYS - STREETS - MOTORING

Vol. XXII

Lexington, N. C., September, 1920

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A Beautiful Highway Down in Louisiana

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SOUTHERN GOOD ROADS PUBLISHING COMPANY
LEXINGTON — NORTH CAROLINA

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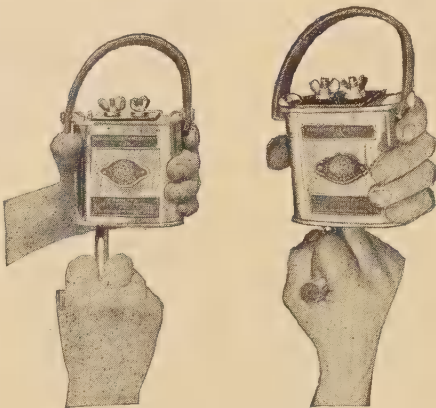
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SOUTHERN GOOD ROADS

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Lexington, N. C., September 1920

Entered at Lexington Post Office as
second class matter

Proposed State Highway System

By FRANK PAGE

Chairman North Carolina State Highway Commission. Delivered
Before Good Roads Association

THE subject that has been assigned me "The Proposed State Highway System, Its Extent, Cost, Surfacing Material and Factors Which Should Govern Priority of Construction" is so long in word, and so large in its scope of discussion that it will probably take days to cover all its different phases. I wish, however, only to outline in a very brief way, and merely as a subject for future discussion, my personal opinion of what should embrace the State Highway System, and how and when and where it should be built.

We have in North Carolina about 55,000 miles of so-called "public roads." Of this mileage about one-tenth, or 5,500 miles, can be selected and arranged so as to care for at least 75% of the intra-State and at least 90% of the inter-State travel. This 5,500 miles of road can be so selected and located as to conform to the requirements of the present highway lay by connecting each county seat and principal town of every county in the State in a most practical way. This mileage will also enable us to meet at out State lines all of the improved highways of our sister States.

The State Highway Commission has recently prepared a map showing the location and routes of this proposed State Highway System, which is not final, but which, in our opinion, will meet the requirements of a large part of the travel of the State.

In my opinion—not speaking as a State Highway Commissioner, but as an individual who, by association and participation in road building for a number of years, and also through observation obtained in the State Highway Commission's office—this 5,500 miles should be built and maintained as a State highway system independent of any county or other political subdivision, and without their participation or financial aid.

A Curious Situation.

The road situation in North Carolina is very curious. Every one of us agree that roads are a

social and industrial necessity. Everybody agrees that our intellectual, material and commercial life depend on, and will expand only in the ratio which we build and maintain adequate transportation system. Still all of us, individuals, township, county and State are, using an army phrase, "passing the buck" to the fellow just above when it comes to financing our road program. It is not disputed that each individual has an alibi. No one will contend that the individual should be taxed with the total cost of public highways. The township has in the past, in many instances, been the subdivision responsible for our lack of roads. No township committee, no matter how efficient the individuals are, has enough funds to buy engineering ability and machinery necessary for the economic road construction in their township. In many instances, after the commission has hired an engineer and bought the necessary machinery they have found themselves without funds to pay for material and labor to actually go into the road. Then the unit of the township is so small the purely local interest will of necessity so locate the roads that they cannot serve as a proper and efficient system when considered from the standpoint of the State.

The county road authorities in most of the counties are the County Commissioners, who are, in my opinion, the most overworked and the most underpaid set of men in the world. It is unreasonable to expect this set of men, no matter how efficient they are, to give their time to the county without receiving adequate remuneration therefor. Some of the counties have Road Commissioners and Road Engineers, who are efficient, and in all respects fill the office from the counties' standpoint, but these gentlemen are not supposed to plan other than for their immediate county and for the county-wide road system. Their interest ends at their county lines. Their roads are located and planned, and properly should be, with the one idea of giving their county

people access to their county town and their trade centers, and to give them the most road for the expenditure of the money.

Range of Travel Lengthens.

When the range of travel on our public roads was limited to the horse drawn vehicles it was about ten or twelve miles, and the county system of roads was satisfactory to everybody, but not when 100 miles with the motor driven vehicles is only a few hours drive, and our interests in social and business activities have so expanded we must think in terms of inter-county, or State systems. Here we come to the proposed State Highway System of 5,500 miles of roads so located and built that a citizen of any town in the State can turn his car on a properly built and maintained road to any other town in the State, every foot of which he has been taxed to construct. Not only do we propose to connect the towns of the State, but by meeting the State Highways of our sister States it is our purpose to make an interstate system that will take care of the very large so-called "tourist movement" that is now coming into our midst. There has been in the past a disposition of every one of the subdivisions before mentioned—when the pay time came—to say to the subdivision just above, "You first, my dear Gaston." The township says to the county, you should help pay for these roads that we are building, as we are an integral part of your make-up, and the county in turn says the same thing to the State, and recently there has been a disposition on the part of the State to "pass the buck" on to the national government. The fact is, that the present State Highway Law provides that the State Highway Commission can only spend the State and county money on the construction of roads in the State, when an equal amount is received from the federal government. This federal aid to our road construction has been a wonderful incentive to road building everywhere, and I think it should, and will be, continued by the next federal congress, and in North Carolina it is my recommendation that this money be used, together with state money, in maintaining an interstate highway system, using our state roads as a medium of meeting our sister states at their border line. However, I declare to you that the time has come when North Carolina should, irrespective of any other financial aid, provide for the building of a purely state system of roads. It is time that we assume as a state the obligations of a state-wide, state-owned, state-built and state-maintained highway system, leaving to the counties their 50,000 miles of county roads to build and maintain, which in itself is a colossal job, and one that will take much time, much thought and much money.

Provide Maintenance First.

I do not believe that any money should be spent in the construction of a road in North Carolina, either state or county, that has not had before its construction, provided a suitable and adequate method of operation and a supply of funds for its maintenance. The economical way to maintain a road is to begin the day construction ceases, and the measure of maintenance should be that the road should be as good five years after completion as the day it was completed.

As a foundation upon which to build the future state system, I should recommend the use of the present automobile license fund, exclusively as a

maintenance fund; That the state immediately take over from the counties the mileage as indicated on the map prepared by the State Highway Commission, and establish and maintain a patrol system of maintenance on this entire mileage, irrespective of what condition the roads are in when they are turned over to the state; That these roads shall be rebuilt as fast as physical conditions will permit economic expenditure, the necessary amount of funds to be furnished by the State.

The cost of constructing this system of roads cannot today be accurately computed by any man. No man can foresee what the next ten years holds in store for us. Therefore, we can only figure in pre-war values, which, by the way, I do not believe will ever return. But using the value of the dollar prior to the recent war, I believe that this system will cost, together with permanent bridges and drainage, upward of one hundred million dollars. However, with today's prices and the fluctuations in the market of material and labor, no man can say what it will cost, but I wish to go on record—that I believe that the system is worth every dollar it costs, no matter what the cost may be. The conversion of this vast sum of money into human energy and building materials will take time, much more time than some of you realize. The Panama Canal, after we took over the job, was ten years in being completed, and the whole world was opened to us for drawing a supply of men and material, and we must realize in this road building program our responsibility to other industries; the drawing together of a vast number of laborers and making exclusive use of all the available supply of building material will seriously hinder other building activity. The state, in my opinion, should convert some of the vast quantities of undeveloped material into usable shape by the establishment of quarries and gravel pits, using State convicts therein and the output of which should be used in the construction of its own road system.

Surfacing Material.

This subject is as liable to create a feud as flirting with the other fellow's wife. I shall say, however, in a general way that the material to be used as a surface should be such that—after a careful study of the traffic then prevailing, and the increased traffic caused by the improvement of the road—will give a satisfactory surface the year round with the smallest expenditure of money, taking into consideration the initial cost and future maintenance. It may be vitrified brick, or concrete, or it may be a red-clay road. I do not believe that a wise physician would prescribe for a patient without first seeing the patient; neither do I believe that a wise road builder can afford to say what type of road should be built at any given place without a very careful study of the local conditions and the traffic the road is expected to carry.

Factors Which Govern the Priority of Construction.

You will remember when the over-zealous mother asked seats of honor in Heaven for her sons, that she was given the answer "Ye know not what ye ask." This answer could well be given to about 98 per cent of the special requests that will come to the governing body of this road program. Every county of the state can, and will, find in their own eyes some peculiar and pressing need for that particular section of the State highway running through their

county to be built at once. In my opinion, this matter should, and will have to be left to a body of men who can see the State and State needs as a whole, and not be governed by the factional, or county prejudice and aspirations. There are certain well defined and known through highways in the State that should, and will have—if the body controlling this expenditure is wise—special consideration, but at this moment it occurs to me that the most pressing need that I know, and the largest obligation of North Carolina in the road building scheme is, to build such roads as will connect the northwest State line, beginning with Alleghany County, and running along the Virginia-Tennessee line to Cherokee County, cut off from the State by mountain ranges. However, their isolation is no greater, and their emergency no more compelling than the six counties that are lying adjacent to Virginia, and north of the Chowan River. These counties are virtually a part of Virginia, and it is our obligation as a State to connect each of these groups with adequate transportation routes, so that they can become again a part of North Carolina. And after these peculiar and pressing needs have been met, it is my opinion that every road should be considered in its relative importance to the whole State, measured by the use it was rendering, and taking into consideration the amount of traffic that would come upon such road after it was properly constructed.

Herrin, Ill.—Herrin township voted \$70,000 worth of bonds for the purpose of building a rock road north from Herrin to Freeman.

ARGEER ON SOUTH CAROLINA ROAD.

An agreement for the construction of a modern road from Princeton to Ware Shoals at a cost of about \$40,000 by Laurens county, S. C., has been reached following a recent conference between the Laurens supervisor and representatives of the state highway department. Laurens county has agreed to use the automobile tax fund and proceeds of two mill levy on this road, and the Ware Shoals Manufacturing company has agreed to pay one half of the cost of building the road.

Improvements under way will give a through highway from Greenwood to Hendersonville and Asheville. The Railroad Commission has ordered the Southern to begin at once construction of the overhead bridge at Deadfall, bridge over mill race has been Creeks are under construction, the river bridge at Ware Shoals has been repaired and a new \$20,000 concrete bridge over the mill race has been completed by the Ware Shoals Manufacturing Company. These projects will give an unbroken system of good roads between this county and the mountains.

At the meeting of the state commission in Laurens the question of a meeting point between Greenwood county and Laurens was taken up and the state highway department has been instructed to send a man to make a survey of what is considered the most feasible route. This, however, will not affect construction of the Boyd Bridge road.



Building a Road with a County Chaingang.

Hard Surfaced Roads

By COLONEL JOSEPH HYDE PRATT

Director North Carolina Geological and Economic Survey

THE State of North Carolina is at the present time, as never before, intensely interested in the question of a State system of hard surfaced roads. Owing, in many instances, to the lack of certain materials suitable for the construction of hard surfaced roads and to the excessive high cost of certain of these, the construction of such roads had not progressed as rapidly as desired. A hard surfaced road is one the surface of which remains hard at all times even during periods of rainy weather and which can be travelled by motor truck or wagon any day throughout the year. Such surfaces should be so built as to withstand the heavy motor traffic that will go over them and which is increasing more and more each year with the additional construction of these improved roads; and the surface must be such that it can be maintained economically. I might state here that no road, no matter what its surfacing material, should be built without provision having been made for its adequate and systematic maintenance.

What road surfacing materials will give satisfactory results? This question is constantly coming up before State and county highway officials, and too often they have tried to answer the question in terms of present-day traffic and not looking to the future—in fact, the very near future,—when the traffic over the road they will construct will be increased many fold and just as soon as the road is constructed. We cannot emphasize too often the fact that, with the construction of continuous lines of improved roads, the motor truck will begin to be used in ever increasing numbers over these roads for the transportation of produce, and that the road surfacing material used must be such that when the road is constructed it will stand up under this heavy traffic.

No State can afford to advocate any one type of road. It is believed by the writer that in many instances too much stress has been laid on certain types of hard surfaced roads, to the exclusion of others which would give just as good and efficient a road.

A concrete road makes a good hard surfaced road, but it is not the only surface that will give satisfaction and that will stand up under the heavy traffic that will go over the roads. With the increased traffic, many questions are coming up and must be answered in regard to concrete pavements. While at the present time we have had little or no trouble with our concrete pavements in this State, there is trouble being experienced in many of the States on account of the pavement being too thin. What is the thickness for a concrete pavement? I do not believe it is possible to determine satisfactorily at the present time just what this thickness should be. Five inches is often too thin; but, considering the traffic that is to go over our roads, what shall be the thickness—6, 7, 8, 9 or even 10 inches?—The condition of the sub-grade will be a large factor in determining this. It is hard to realize the tremendous force exerted by a heavy loaded truck where,

on account of the unevenness of the concrete pavement, there is a chance for a truck to exert a blow by a drop of say 1-8 of an inch. Experiments are being made at the Arlington Testing Laboratory of the office of Public Roads of the effect of impact on a concrete slab equal to the force of a drop of 1-8 of an inch of a load equal to that of a heavy loaded truck. Such repeated impacts are breaking five-inch concrete slabs. These five-inch concrete slabs on roads are being broken and crushed by the traffic and this breaking of the slabs becomes intensified if the sub-grade upon which they rest has not been thoroughly prepared and kept free from water. If cavities and soft spots develop, they will hasten the breaking of the concrete road surface. This question of preparation of the sub-grade upon which a concrete surface or other surface is to rest has not been given the serious consideration which it should receive by highway engineers, and in too many instances improved hard surfaced roads have been constructed where the contractor has not been made to prepare its foundation in a satisfactory manner. With the heavy traffic that comes with improved roads, there is a great deal more need than ever before for engineers to give more serious consideration to the preparation of the sub-grade before any surfacing begins. Fills of any importance should be given plenty of time to settle before the hard surfacing is constructed.

How to Eliminate Failures.

As suggested by the Office of Public Roads, our road surface failures may be eliminated in one of the following ways:

(1) Make the road surface thick enough so that the pressure will be sufficiently distributed to the underlying sub-grade, or so that the surface because of its inertia may absorb a considerable amount of the shock of traffic; or

(2) Design the slab to have sufficient strength to bridge over the soft sub-grade; or

(3) Improve our drainage systems to exclude the moisture in dangerous amounts from soils which are rendered of very low bearing value by the presence of water.

In the passing of heavy loaded trucks it was noted that a two-inch stone lying on the surface of the road was completely crushed by the truck, and the truck had solid rubber tires. This illustrates the pressure exerted by the trucks.

Referring once more to the concrete road: If there is a scarcity of cement, as there appears to be in this State at least, the construction of the concrete road should not be considered if there is not sufficient cement for concrete to be used in the construction of buildings, piers, etc., and at the same time for roads. For some of these purposes there is nothing that can be used in the place of concrete. In road construction, however, we have several materials, as stated before, that will make satisfactory and efficient hard surfaced roads equal, if not in

some cases superior, to the concrete; and at a cost that will justify their use.

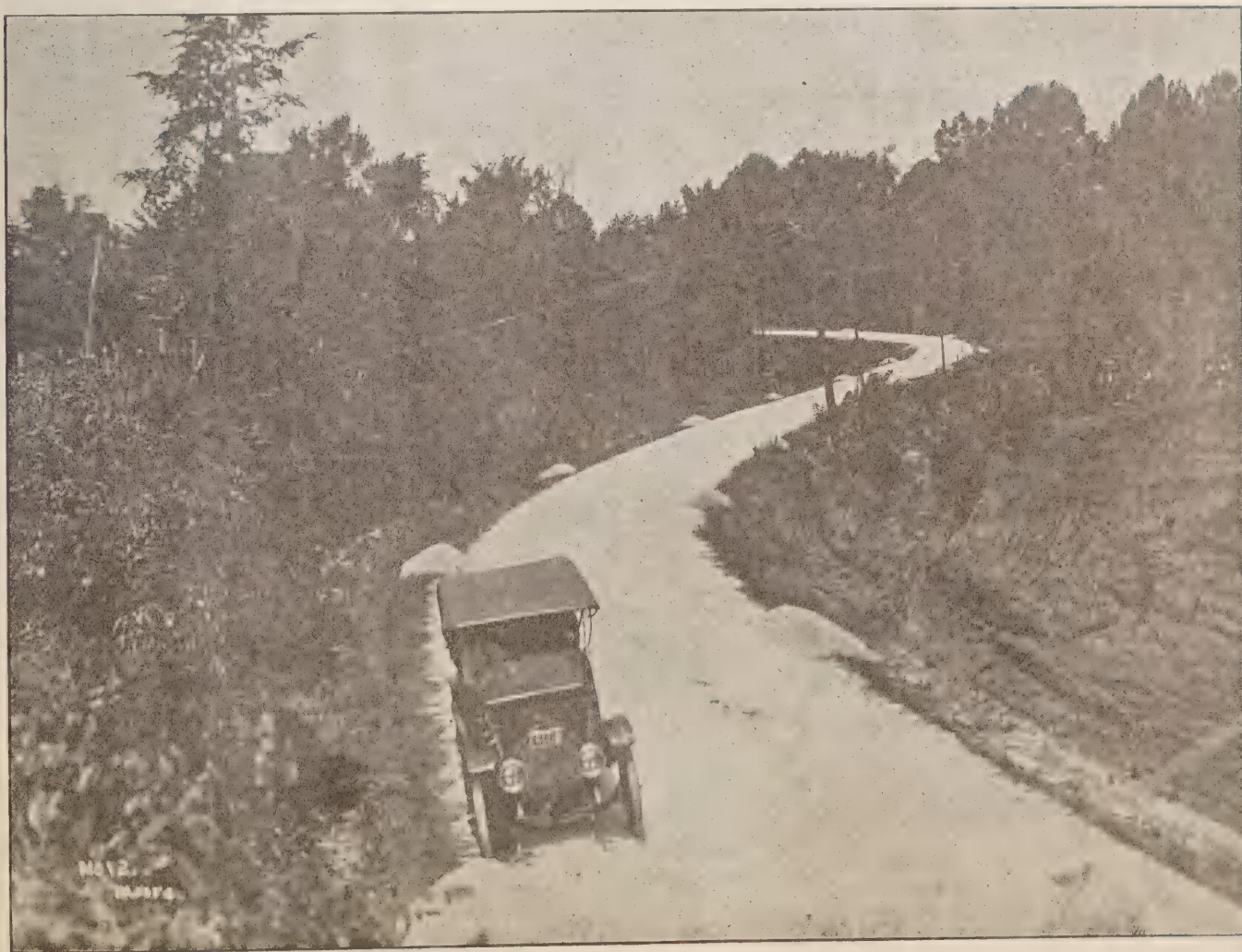
A bituminous concrete surface has an elasticity which is not found in the more rigid concrete surface. While we have been advocating in nearly all cases a concrete base for the bituminous concrete surface, I see no reason why a most satisfactory road cannot be constructed with a heavy rock base and bituminous concrete surface. I believe such a hard surfaced road can be so constructed that it will stand up under heavy traffic and will make an ideal road. Then again, such a road is readily and easily maintained. I believe this type of road is one that should receive serious consideration, particularly in connection with hard surfaced road construction in the mountain and Piedmont areas. We have plenty of rock in easy access to nearly all roads in these districts which will make a satisfactory foundation.

Crushed rock for bituminous concrete or cement concrete should be obtained in much greater quantity in North Carolina than at the present time. Instead of importing crushed limestone from West Virginia or Tennessee, we should be producing every bit of such rock that is needed in construction work in this State. Granitic rocks are plentiful throughout many sections of the State in easy access to railway transportation which will give

a crushed rock product suitable for concrete work. At the present time there are but few rock quarries making crushed stone for this purpose, and at some of our building stone quarries no use whatever is made of the waste rock. Where a stone quarry can be developed with good railroad transportation I believe a crushing plant would make a very profitable investment.

Sand-clay and gravel roads should not, according to the writer, be considered as improved hard surfaced roads for main lines of travel, as, with the increase in the heavy traffic, they will not be able to stand up under the strain. They can, however, be used very satisfactorily for inter-county and inter-township roads. Where an improved road is being constructed which in the grading has called for many heavy fills, it probably would be a very wise precaution to surface these fills with gravel until they have had sufficient time to settle and become firm before putting on the harder surface.

Another point that it is desired to bring out is that if the greatest use is to be obtained from the hard surfaced roads in this State, they must be continuous; and there should be no intervals where the hard surface has not been constructed. In case these intervals of poor road or un-surfaced road are left, the motor truck and automobile traffic is very much handicapped and during some days of



Fine Type of Road in Warren County, Mississippi

the year cannot travel over the road on account of these bad places.

Width Important Factor.

In discussing a hard surfaced road it is necessary to give serious consideration to its width, as motor traffic will become the principal means of transportation over all of our hard surfaced roads. Even in this State, the number of automobiles has increased from approximately 1,200 in 1910 to over 120,000 in 1920, and motor trucks have increased from perhaps one in 1910 to many thousands in 1920; although the State has not constructed through lines of traffic across the State, either north and south or east and west. With the completion of the inter-State and inter-county roads, the motor truck traffic is going to become much greater, and through motor truck transportation not in competition with railroads, but because the railroads cannot handle the traffic—will become greater and greater. Even now, places in cities of Michigan and the other Middle West States, are sending loaded trucks to the East and bringing them back loaded with produce.

In considering the width of the improved hard surface the first thing to decide is whether or not it shall be a one-track surface or a double-track surface. If it is only to be a one-track surface, 10 to 11 feet is a sufficient width for the surface; and no one will try to make it a double-track surface in passing. On the other hand, if the surface is to be considered as a double-track surface, it should be made sufficiently wide so that the road will be perfectly safe at all times for the passing of vehicles. To my mind, a 16-foot surfaced road is a death trap. With the present construction of automobiles and motor trucks it is possible for them to pass on a 16-foot road, but in some cases with but a few inches of margin. It is impossible for them to pass if traveling at any speed. It is therefore necessary for one or the other, if not both, to leave the surfaced road. As a rule it may be stated that a truck, especially a loaded truck, will not leave the surfaced road, particularly if the vehicle to pass is an automobile or wagon. The driver of the automobile does not wish to leave the surfaced road, especially in wet weather; and the result is many accidents on surfaced roads 16 feet in width. The chances of accident become greater in rainy weather. While 18 feet is better, I believe no double-track surfaced road should be less than 20 feet wide, preferably 24 feet. It is realized that this additional width adds a great deal to the cost of the surface, but the writer's idea is that, if the community or the county or the State which is constructing the hard surfaced road cannot afford to build a safe double-track surface, then build a single-track surface on one side of the road and so designed that the other half can be constructed whenever funds are available, then making a double-track road.

The Bridge Problem.

Another subject that must be considered in the construction of these improved hard surfaced highways is bridges. Counties, and even the State, have constructed bridges as part of our improved highway system which are incapable of carrying certain loads. Our highway engineers should, in planning the improved surfaced roads in connection with the heavy motor traffic that is going over them, be sure

that the bridges already in and to be built will carry the heavy loads that are expected over the road. Most of our bridges have a factor of safety that will enable them to sustain the weight of these loads up to a weight that the writer believes is the maximum that should be allowed over any surfaced road that the State should build; namely, 20,000 pounds. It is hoped that through the medium of the American Association of State Highway Officials and the National Automobile Chamber of Commerce satisfactory automobile and motor truck legislation can be worked out that will be adopted by all the States. It has become necessary in some States, as Connecticut, to construct at the State line scales to weigh loaded motor trucks and see if they are in excess of the weight allowed over the Connecticut roads; which at the present time is 25,000 pounds. According to the State engineer, it is seriously considered reducing this to 20,000. Whatever the weight that is to be allowed, it should be decided upon, as it is



A Florida State Aid Road

necessary to the protection of the roads. Recently 55 trucks passed over a certain piece of paved road in Connecticut and when all had passed the pavement had been broken and driven into the sub-soil. The owners of the trucks were obliged to pay for the reconstruction of the road; but the non-use of the road during reconstruction was a loss to the State. It was mishaps of this type that led to scales being placed at the State lines, as these trucks came in from one of the adjoining States.

A committee of the American Association of State Highway Officials is now considering the design of motor trucks in relation to the design of roads, and it is hoped that in their report they will give in the investigation what is considered the weight that should be allowed on trucks of various design and what types of roads are necessary to sustain such weight.

In closing, it would seem to me that the following points should be very seriously considered in the construction of improved hard surfaced roads; first, the type of surface in relation to the type of traffic that is going over the road; second, the preparation of the sub-grade for the surface; third, the thickness of concrete slab in the concrete road and the thickness of the bituminous concrete in that type of road; fourth, the width of the hard surface; fifth, the weight of load that will be allowed to go over the road; sixth, the speed at which the motor traffic vehicles will be allowed to travel.

Truck Traffic and National Highways

By PYKE JOHNSON

Secretary National Automobile Chamber of Commerce

IN order to arrive at a proper background for our transportation problems of today, it is necessary to go back for a period of 14 or 20 years to a time when automobile transportation was looked upon as a dream of the visionary. The space of time is a short one but the difference in transportation is almost the difference of centuries since only twenty years ago there was very little difference between the mode of highway travelling in the United States and that practiced in the countries of the ancients years ago. Travel was purely local in its limitations. The farmer hitched up his team in the morning and drove an average distance of ten miles to market. If he lived much further away, it became a matter of more than one day's time for him to get his produce to the shipping point and in consequence the area of production generally speaking, was pretty well defined save in the production of live stock where the cattleman or sheep herder was able to drive his stock to market, grazing them as he went along.

The railroads served as the only means of communication for any distance and in consequence inter-communication was more sharply restricted, few taking trips for recreation save at annual periods.

Today the motor truck and passenger car have brought about already a tremendous revolution in our way of living, our market problem and even in our thought. The farmer is no longer limited to the immediate market point. The automobile has eliminated distance. It is not unusual to see a motor truck make a daily journey of 125 miles carrying perishable produce to market. The passenger serves to bring the producer into closer relationship with the consumer than has ever been possible in the past. The farmer's family is no longer isolated. The boy goes to a community school for his education, travelling in the family flivver or in the community motor bus. The mother goes to town to do her shopping and attends social centers where she learns the latest methods in domestic science and in the up bringing of children. In the evening the whole family is able to get into the machine and go into the town or city where they see the movies and come into close contact with all that is going on the world over.

In some districts such as the wheat belt in Minnesota we find from a study of the census reports that a number of rural communities having no manufacturing nor any other source of income in the town, have increased enormously in population. An investigation shows that the farm laborer is no longer living on the farm but that he goes to the city each evening and is taken to labor by the farm bus in the morning.

The doctor is able to make his rounds in the country in time to save many a life which would have been lost under the old condition of travel. In countless other ways, both passenger car and motor trucks have proved their worth until today they have become generally recognized as economic fac-

tors in our social life which could not be done away with and which cannot be discounted at any time.

Must Face Tomorrow's Problems.

If this is true today, it will be even more true tomorrow. Already there are seven and a half million automobiles and some seven hundred thousand motor trucks travelling over the roads in the United States. Who can say what their number be or what their scope of action will be in another decade? All we know is that this motor travel has come to stay, but it has brought with it new problems and that we must now face those problems if we are to build adequately for the traffic tomorrow.

Twenty years ago it has been said the road problem was a local one. The township or county was amply able to take care of such construction and maintenance as was necessary. But with the advent



Where Heavy Traffic Has Ruined Granite Block Pavement

of the more rapid form of transportation, machines began to go from county to county and at once the problem of taxation became a State question rather than a local one, so our laws evolving to meet the evolution in traffic were broadened until the state began to lend aid to the counties in the construction of their roads. Later experience shows that this system was inadequate. In Wisconsin for example, twenty-two million dollars were expended in road construction under this plan and the problem was one which could not be handled locally but was one which required not only finances from the State treasury, but supervision and control of construction from that point as well. This stage reached, the next which followed was that of Federal Aid to the States in the construction of their highways and now as travel has progressed and we find political boundaries erased, the time has come when the government should step in to take control and finance the construction of inter-state systems of highways which will bind the States of the Union together,

just as has State construction served to bind together the counties in the past.

Travel No Longer Local.

In any discussion of the national situation, it appears necessary to lay down first the reason for that construction and then the principles which should govern it. It has been indicated that travel is no longer local and that it proceeds from State to State. In other words, we have come to a place where State control is no longer enough and where there must be a national authority to provide a policy which will meet with the varying requirements and needs of the 48 States, something which officials pledged first to consider intra-State needs cannot hope to bring about. Beyond that need there is need for the strengthening of our common defense and for the creation of a second line of transportation which would serve the nation in times of emergency. Under this heading, there is need to consider the enormous value of a system of roads which would do for the United States what the French roads did for the Allies on the Marne and at Verdun. Such a system of roads as that indicated is perhaps better defined in the measure which has been introduced in Congress by the Hon. Charles E. Townsend, Chairman of the Senate Committee on Post Offices and Post Roads, than by anybody else. This measure would provide for the construction and maintenance of a national highway system, solely at the expense of the Government and under the direction of a Federal Highway Commission.

The bill provides that there shall be constructed in each State two main roads, preferably running north and south and east and west connecting up at State boundaries with other National Highways and comprising in all not more than one per cent of the total mileage of the State, save where an additional percentage is necessary to provide for the construction of these two roads.

The location of the roads is left to the National Commission to determine with the advice of the State Highway Departments and with the provision that these roads must tap the chief centers of agricultural and industrial production. The highways are to be constructed of a type adequate to meet future needs of traffic with due regard for the economics of the situation with a minimum wearing surface of 20 feet. An adequate maintenance is to be provided for from the National Treasury.

Townsend Bill Defended.

In the construction of these highways, Senator Townsend's measure does not seek to set up a dual form of administration in opposition to the State Departments, nor does it seek to belittle or minimize the importance of those Departments in any way. It does say that construction shall be undertaken as it should be by the National Government where the State Department is inefficient, but where the State Department is equal to the task ahead, then the bill specifically provides that the Commission shall enter into an agreement with the State Highway Department to handle all of the work of



Henry County, Kentucky, Road from Newcastle to Eminence

location, construction and maintenance under the supervision of the national authorities.

In those States where road work has already been undertaken to any marked extent, the bill provides that wherever the road has been constructed to a point deemed adequate for its use in a system of National Highways, then the Commission shall authorize or itself construct a mileage of co-ordinated or correlated highways, equal in valuation to the work already accomplished by the State. The only difference being that in the case of construction of this kind, the road is then turned over to the State for maintenance while the maintenance of the National Highway is undertaken by the Government.

The effect of the construction of such systems would be immediate. It would at once serve to release State funds now tied up in Federal Aid projects for the construction of the principal State highways. County funds would similarly be released for use in construction of county highways and the example



Bridge Over Creek in Wayne County, North Carolina

set by the National Government or by the State Department working to the standards of the National Government, would at once expedite and facilitate the whole road program of the several States. The farmer would find this farm-to-market road improved more quickly than possible under the present plan and what is of more importance to him, he would find that State funds now tied up for construction purposes would be released for maintenance which is after all, the heart of the whole road program.

A Federal Highway Commission.

In so far as the creation of a Federal Highway Commission is concerned, it is believed that such a commission made up of men chosen to give geographical representation of the several States would arrive at a more truly representative policy than is possible under the present plan. A continuity of the program would be assured as the Commission would not change every four years as does the Secretary of Agriculture. Further, the magnitude of the road problem ahead is such that road building should no longer be subordinate to any other activity of the Government, particularly when the funds appropriated for road construction are larger than

all of the other funds available for all of the other bureaus of the Department of Agriculture. If it is logical that there should be a State Highway Department instead of a road department working as a subsidiary Bureau of the State Board of Agriculture, then the same logic should apply nationally. Road construction should be taken out of politics as much as possible and the work should be freed from red tape and left in the hands of economic experts for their decision. As for the question of continued Federal Aid, it should be plainly noted that the Townsend bill continues the present appropriations and provides specifically the recommendation as to their future continuance shall be made by the Federal Commission. The severe limitations which have been placed upon the road program of the country this year by lack of transportation equipment, shortage of labor and lack of building material, makes it appear that the road program of 1920 will fall far short of forecast. This being true and the transportation at least being one which offers no immediate prospect of relief, we may say with reasonable certainty that there will be few States if any which will have expended their Federal Aid appropriation by the end of 1923. This being the case it behooves us at this time to make our preparation for any future construction so that when the time for future appropriation comes, the United States will have a definite policy for road construction. If the Congress of the United States in its wisdom will create a Federal Highway Commission at the next session of Congress and if they will authorize that Commission to make a study and survey of all National highway systems and of Federal Aid together with such recommendations as may be deemed desirable for the future of both, then the preliminary engineering steps will be provided for and as we come back to normal conditions, we will find ourselves ready to go ahead in a definite comprehensive way, building to the best interests of the country at large. The task ahead is an enormous one. It is one which will tax the fullest facilities of County, State and Nation. It is one which calls for the greatest possible co-ordination of effort in order that each unit may be assured of a full dollar valuation for every dollar of public funds expended.

As the work is carried on, it will make for a more fully transportation system which in turn implies a finer nationalism. The way to achieve the result is for all of us to pitch in and work together.

WORK IN HARRISON COUNTY, TEXAS.

With eight grading crews at work, employing nearly 150 teams, and one bridge crew at work on the construction of Harrison County (Texas) roads, good progress is being made, according to County Engineer George A. Duren, and some of the roads will be completed by winter.

There has been some delay, but this has been overcome. Rock stations are being established along the roads under construction, and plenty of native rock will soon be on hand for all work.

Paris, Ky.—With a view to stimulating interest in the movement for better county road and promoting the sale of road bonds, a mass meeting of the citizens of the city and county will be held in the court house.

Unprecedented Road Building Through Federal Aid

More Federal Aid This Year Than All States Spent on Road Projects Four Years Ago

THE unprecedented stimulus given highway construction in the United States in the four years that have passed since the Federal Government entered upon its policy of aiding road improvement, is shown by the fact that road operations under the Federal aid road act thus far initiated aggregate in length nine times the distance from New York to San Francisco, according to Thomas H. MacDonald, chief of the Bureau of Public Roads, United States Department of Agriculture. The Federal Government's share in this stupendous undertaking is greater than the cost of the Panama Canal. The participation of the National Government in highway improvement marked a departure from a policy which had been followed for nearly a century. Federal co-operation with the States on approximately a "50-50" basis has counted more than any other factor, says Mr. MacDonald, in initiating highway construction that is being carried on under adequate supervision, and in accord with a program coordinating local, State and national needs.

Highways of Splendid Types.

Second only in importance to the size of the present road-building program is the excellence of the character of the roads being built. Sixty per cent of the total allotment of Federal funds which has been approved to date will be spent for roads of such durable types as bituminous concrete, Portland cement concrete, and vitrified brick. These roads when built will increase by 7,600 miles the total of 14,400 miles of roads of this class which existed in the United States before the Federal-aid road law was passed. But these figures by no means represent the total mileage affected.

In 1915 the total expenditure for roads and bridges by all the States and local governments was \$267,000,000, while this year the estimated funds available for main road construction are nearly three times that amount, or \$633,000,000. In all, Federal funds to the amount of \$266,750,000 have been apportioned among 48 States without a suggestion of favoritism—so adequate are the provisions for a just apportionment.

Many New State Highway Departments.

One of the early and most far-reaching results directly attributable to the adoption of the Federal-aid program was the creation of adequate State highway departments in 17 States which previously had either no State department, or departments insufficiently equipped. Within one year after the passage of the Federal-aid road act more constructive State highway legislation was placed upon the statute books than had ever been enacted in a similar period in the history of the country.

The insistence of the Government upon the construction of Federal-aid roads under the supervision of engineers of the State departments has resulted in placing a much larger proportion of road work

under skilled direction. In 1915, the year before the Federal-aid act was passed, only 30 per cent of the money for roads and bridges built in the United States was expended under the supervision of State highway departments. This year these departments will exercise control over fully 80 per cent of the large sums that will be spent for road building.

The Federal Government's present program of highway improvement is the result of two acts: the Federal-aid road act signed by the President July 11, 1916, and provisions in the Post-Office appropriation bill for 1920 signed February 28, 1919, containing an amendment to the original Federal-aid road act. The original appropriation of \$75,000,000 was made available for rural post roads in installments at the rate of \$5,000,000 for the fiscal year ending June 30, 1917; \$10,000,000 for the fiscal year 1918; \$15,000,000 for the year 1919; \$20,000,000 for the year 1920; and \$25,000,000 for the fiscal year ending June 1921. Ten million dollars for forest roads was made available at the rate of \$1,000,000 a year after July 1, 1916. The apportionment of the post-road appropriations of the States after deducting the administrative fund, which must not exceed three per cent, is based upon area, population, and mileage of rural delivery and star routes in each State. Each of these factors have a weight of one-third.

Federal Activities Broadened.

Three months after the signing of the armistice the Post-Office appropriation bill for 1920 became a law. One of the important amendments which it contained provided that the term "rural post roads" as used in the earlier act was to be construed to mean "any public road a portion of which is now used or can be used, or forms a connecting link not to exceed ten miles in length of any road or roads now or hereafter used in the transportation of the United States mails." The law also changed a limitation to the effect that the government expenditure could not be in excess of \$10,000 per mile (exclusive of bridges of more than 20 feet clear span) by raising the maximum to \$20,000 per mile. This Post-Office appropriation bill carried an additional appropriation of \$200,000,000 for the construction of Federal-aid roads and \$9,000,000 additional for the construction and maintenance of roads and trails in the national forests.

All of these Federal funds may be expended only for construction and must not exceed 50 per cent of the value of the roads. In other words the States either directly or through county or other government units, are required to bear something more than half the total cost of their road improvement.

Under the law the Secretary of Agriculture is charged with the administration of the Federal-aid act. He has assigned the details of administration to the chief of the Bureau of Public Roads, a branch of the department which is considered to be in closer touch with the highway situation and requirements

of the country as a whole than any other agency in the United States.

States Must Initiate Projects.

The Federal-aid act requires that road projects for Federal aid be initiated by the States. As a first step a statement is forwarded to the district engineer of the Bureau of Public Roads, announcing in effect that the State proposes to build a piece of road of a certain type and length in a certain location. This notice, known as a "project statement," is accompanied by an estimate of cost. The project statement is examined by the district engineer to determine whether the project complies with the Federal-aid road act. If his decision is favorable he forwards the statement to the Washington office with his recommendation. There it is examined by the chief engineer and his assistants, and if the latter concurs the project is placed before the Secretary of Agriculture for his approval. Until the Secretary has acted, no further action is taken by the State. Over half of the projects handled are passed by district officers in an average of five days—an illustration of the manner in which work can be expedited even where a large organization and complex procedure are involved.

Up to June 30, 1920, 2,985 projects involving a total of 29,319 miles of road had been approved by the

Secretary of Agriculture. The preliminary estimate of the cost of these projects is approximately \$384,900,000, of which approximately \$163,841,000 will be approved as Federal aid. On the same date 2,116 projects representing approximately 15,944 miles had either been completed or were under construction. The estimated total cost of these projects in various stages of construction and completed, is \$200,000,000. The total cost of Federal-aid work approved by the Secretary in the 19 months subsequent to the signing of the armistice, and prior to July 1, 1920, which is approximately \$330,000,000, exceeded by \$63,000,000 the cost of all road and bridge work done by States and counties in this country in 1915. The value of the work completed during that period amounted to \$60,000,000, a rate of construction equalling that of the Panama Canal.

Asphalt surfacing of the streets of Jackson, Ala., is \$1.30 per square yard while similar work under way in some other cities of the state performed under contract is costing from \$1.75 to \$2.25 per square yard, according to the street commissioner of Jackson. The municipality is operating the asphalt plant and the paving is being laid with day labor instead of by contract.



An East Tennessee Road, Near Johnson City, Before Progress Struck It.



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HUMANITY OF ROAD IS GOOD.

Much has been written about the road as an innate thing. Authors have word-painted the beauties of the broad highway. Poets have sung the praises of the open road. Artists have painted the silent mysteries of nature's wonderful breathing spaces. The geniuses of verbal expressions have done a master work in drawing forth an appreciation for the routes of common travel; these great stretches of land with numerous tributaries, which are the connecting links between a rural and urban people—binding them, grip-like, into a more sociable family. This fact, no doubt, is responsible for the oft-used term "good roads." If their goodness ended here, their influence would be somewhat limited. As it is, they are cosmic for good.

The pleasure-seeking motorist glides over the smooth-surfaced roads with positive contentment and breathes with freedom the freshness of woods and fields. But what is true of life relationships applies equally to the broad highway. One cannot always receive pleasure and not expect to give something in return. The road, being a constant giver of enjoyment, exacts a toll in exchange—an expression of self in an emergency. This is the personal side of the road—that which invites helpfulness to the distressed and makes the disabled motorist a newly-made friend. If the goodly influence of the road were here circumscribed, its righteousness would be restricted in scope. There is another characteristic radiating from the road which makes it in truth a missionary. For here at times birth is given to the highest and noblest qualities of human nature. A pedestrian may be roaming idly along the highway and he is met by a motorist alone. The walker is asked to ride, the men exchange words, and, although strangers, they are made sociable

people. Selfishness has been robbed of being. Then, again, the car may seat several occupants, and the knight of the highway is invited to share an unoccupied place and their society. He reads in the invitation, sympathy, kindness, and realizes that there is humanity in every mile of the avenue of mortal wayfaring. All that is needed is the circumstance to call these finer inherent characteristics into expression.

TO BUILD AN "IDEAL ROAD."

Probably, the best thought of the highway engineers of America is being given to the drafting of specifications for the "ideal section" to be built somewhere along the Lincoln highway with funds provided by the United States Rubber Company. The Lincoln Highway Association, in Detroit, is receiving hundreds of suggestions from engineers in every part of the United States, indicating a deep interest in the project.

In asking for opinions from America's highway engineering profession, the Lincoln Highway Association pointed out that it realized that no set of specifications could be determined upon which would adequately serve all sections of the country or even all main highways in every part of the union. It took pains to make clear that the specifications desired were those for a main traveled highway, carrying not less than 10,000 vehicles a day at present and destined to carry a still heavier volume of travel in the life of the improvement. The questions asked of the engineers related to width of right-of-way, width and thickness of paving, method of drainage, advisability, beautification and lighting, permissible cost a mile, and other items.

As was expected, a wide diversity of opinion as regards the specifications for such an "ideal section" is being indicated. As rapidly as possible the officials of the association are tabulating the replies and suggestions received and these will later be subjected to the careful scrutiny of a competent board of fifteen of the most representative and experienced highway engineers and other authorities of the United States. The personnel of this board will be announced soon by the association. It is clearly apparent that the majority of the engineers who have replied feel that a right-of-way wider than those now being provided is desirable if the future increase of highway transportation is to be anticipated and provided for. Permanent monolithic pavement is the almost unanimous verdict of those so far heard from.

That the importance and educational benefit of the "ideal section" has a much broader appeal than among those actually engaged in highway construction is indicated by the hundreds of letters the association is receiving from motorists and the public generally making suggestions and commending the idea. A general digest of the current engineering opinion as regards the ideal specifications will soon be released by the national headquarters of the Lincoln Highway Association.

The contract for grading, draining and gravel surfacing 17 miles in Trigg county, Ky., was awarded to N. E. Stone and company.

TO BUILD GREATER MOTOR SCENIC WAY.

Rivalling the wonders of an airplane trip over the Roof of the Rockies, the world's greatest scenic automobile highway—which the United States government soon is to start hewing across the big range in Glacier National park—will afford tourists the most stupendous panoramic view ever presented to the human eye.

This is to be a highway in a literal sense, according to Motor Travel, for it will lead right over the Transcontinental Divide, rising to an altitude of 9,000 feet. The roadway will be about thirty-eight miles in length, and Stephen T. Mather, director of national parks, estimates it will take five years to build it. The survey was completed this spring. The road will start near the head of Lake McDonald, and extend along the east side of that picturesque body of water to the head of the lake and thence up beautiful McDonald creek valley to Tapper creek, along Tapper creek, where it flanks the sides of magnificent Mount Cannon; thence over Logan Pass, through the Hanging gardens, down Reynolds creek, skirting the base of Going-to-the-Sun mountain and along the upper shore of upper St. Mary's lake, Going-to-the-Sun Chalet village, thence along the north shore to the foot of St. Mary's lake, where it joins the east automobile highway which Louis W. Hill, chairman of the Great Northern railway, personally laid out and paid for. This east side mountain highway which Mr. Hill built is thirty miles long. It leads to the Great Northern railway at Glacier park station, the main gateway of the park. In constructing this road Mr. Hill had his road builders hew nine miles through a primeval forest of pine and fir at a cost of \$100,000.

For a greater part of the distance the grade of the Transcontinental Divide Automobile highway will be about six per cent, though occasional short stretches will reach eight per cent, to which the engineers are to be restricted. None of the curves are to be with less than a 50 per cent radius. On the east side of the Transcontinental divide there will be an eight-mile stretch in which the grades are considerably easier. For the greater part of the way there the grade will be four per cent or less.

There will be short distances on each side of the summit where the highway must be cut along almost perpendicular cliffs, but most of the way the engineering task will not be so difficult, as it is merely a matter of cutting a shelf along the sides of the mountains. Passing places will be provided, giving adequate protection to traffic.

LOUISVILLE-OWENSBORO ROAD.

A splendid thoroughfare from Owensboro to Louisville is a certainty of the next year, according to Kentucky State District Engineer D. J. Boone. The contracts for the construction of the Ohio Valley route through Breckinridge and Hancock counties will probably be let this month, and work has already been started on the construction of the highway through Meade and Jefferson counties.

From Louisville to the Meade county line the highway will be built of Kentucky Rock asphalt, affording a fine roadway for fifteen miles.

Spurrier, Ellis and Smeathers, a contracting firm of Louisville, secured the contract for building the

14 miles of the highway through Meade county for approximately \$135,000.

They have already started work with some 50 teams and as many men and expect to have the grading and draining completed this year. The surfacing of the route through Meade county will be completed early next year.

Citizens of Breckinridge and Hancock counties, who subscribed to the building of the highway through those counties, are anxious that work shall begin as soon as possible. The contract for the work in these counties will be let in the next few weeks and the grading and draining of the route through these counties will probably be nearing completion by the end of this year. The longest stretch of the road is through Breckenridge county, as the road makes a wide detour in this county to pass through Hardinsburg.

Daviess county officials because of the lack of funds are not likely to do anything toward constructing the road this year but next year will probably be started. However, this county already has an excellent rock road which closely approximates much of the proposed highway route.

Progress toward constructing the highway in the counties west of Owensboro is not so rapid but some of the counties will probably start work this year. Henderson county officials are anxious to build their part of the road as soon as possible and the same is true of McCracken and other counties.

WORK ON SOUTH CAROLINA ROAD.

Work has been begun and is now well under way on the road between Duncan and Greer, according to the Spartanburg (S. C.) Herald, the work having been started on the Duncan end. The stretch of about four and a half miles between Greenville and Spartanburg. This is said to be the worst in the whole roadway between Greenville and Spartanburg.

The kinks are being taken out of the road, according to The Herald and a sharp curve is being eliminated on the Duncan side of the bridge and the road built straight to the stream. It will take considerable filling, but the approach to the point where the new bridge will be constructed is shaping up nicely. Quite a number of men and teams are busy on the job. The grade crossing will be eliminated and the road, instead of crossing the track of the Southern, will run all the way to Greer on the north side of the track.

What is known as the Old Laredo Government Road is to be reopened by the Maverick County, Texas, commissioners as a result of agitation for a border highway between Eagle Pass and Laredo. This road follows along the Rio Grande as close as it is possible in avoidance of the many arroyos, which at some places are very big. As a result the road at some points is 10 miles from the river. The distance to Laredo over this road is estimated to be about 120 miles. The present road to Laredo extends by way of Comerta, Carrizo Springs and Cotulla and makes the distance about 140 miles.

Nicholasville, Ky.—Contract for paving with concrete about 1980 square yards of Depot street has been awarded to Clerk, Stewart & Woods, Versailles, at a cost of \$10,713.

On What Are We Building Our Highways

By H. G. SHIRLEY

Secretary Federal Highway Commission

Much money is being expended annually in investigating and testing road surfacing materials. The Federal Government, many states, companies interested in the different materials, and private institutions have established large laboratories for such purpose. Yet we seldom find a laboratory making a study and test of the foundation soils.

Lately the Bureau of Public Roads has taken up this investigation in a small way and we appreciate the great value of such an investigation and study, but the appropriation allotted this Bureau for such an investigation is so small, it will not permit of an extensive research.

Each spring many sections of our roads go to pieces, due to the foundation becoming saturated

surface materials have been studied and experimented with at great expense until they can be put together and given known results.

It recalls to the writer's mind the biblical phrase, "What doth it profit a man if he gain the whole world and lose his own soul." For what will it profit us if we develop the very highest type of surfacing if we lose it all by a weak and unknown foundation. The question of a stable, firm, and unyielding foundation must have our best thought. The physical and chemical composition of the sub-soils are so complicated that to properly solve this problem will require the very highest type of skill and intense investigation. Problems of materials, water, frost action, physical effects of heat, cold and moisture must be solved. The chemical action of acids, alkalies, and the many other different elements found in the soils leading to unknown field must be found out. Not until this is done and the bearing power of the sub-foundation can be ascertained by a simple test or brought to a known condition by treatment, will this problem be solved.

It is therefore most important that such investigations should be made and a solution found quickly,



A Scenic Loop at San Antonio, Texas



New Surface on a Kentucky Highway

with moisture, frost action, seepage, capillary action, and other causes. It is useless to expect the road crust to carry all the load unsupported. A firm foundation for our highways is just as essential as it is for every other structure or pursuit in life. The little study that has been made of the foundation has been devoted to draining wet places where the sub-base is constantly saturated by seepage water. Such places have been studied and in many cases remedied, but there has been very little, if any, study given to the bearing power of the different types of soils as a foundation. Especially at the period of the year when they are saturated with moisture, or the reverse when they are dry and contracted.

It is safe to say that we know less about the sub-foundation and its ability to sustain the metal surface under the moving load, than any other feature of road construction. There has never been any constructive effort made until recently to find out just what takes place or the ability of certain types of soils to withstand the impact and weight of a heavy moving load. I know of no element so important in road building that has been studied less and so little known of as the sub-foundation. The

so that the roads in the future can be constructed to carry the maximum traffic over their entire length without injury.

This applies to the railroads and electric railways the same as it does to the highways, and all should join in a co-operative way in this investigation and find a solution. Congress should be requested to make a sufficient appropriation to the Bureau of Public Roads to establish a large research department so that such investigations can be speedily made and a practical solution found. By all working together a solution will soon be found, and much money annually saved.

A concrete road from Carthage to Carterville, Jasper county, Mo., is to be constructed by the Carthage Special Road District during August. The road will be six and one half miles long.

A MILLION-DOLLAR ARKANSAS ROAD.

The Little Rock-Spring Lake Road District in Arkansas will spend approximately \$1,000,000 in constructing 28 miles of road, 19 miles of which run almost directly south, and nine miles of which branches off near the Grant county line to Woodson. It will probably be 18 months before it is finished.

Slowly and steadily the work has progressed since the contracts were let and work began last December. One can get a glimpse of the wonderful road it is to be, a road that stretches away mile after mile, rounds corners with smooth curves, mounts hills at low angles and is lifted above the mire, mud and water of the Fourche River bottoms. A wonderful road, but it can only be glimpsed as one jolts along broken stretches and sees places where the new road is to run over a path cleared through a forest of spruce and pine.

Sunken bridges, badly out of repair, irregular breaks in the road, a roadway cut through a forest studded with stumps, sharp turns to avoid new culverts, fresh dirt on the road, steep hills, breaks where filling has left off and the road seems to end—mark the road as it is at present, but through it all one can see the road of the future.

Only one stretch of the road is ready for asphalt, and that is the stretch from Twenty-eighth street to the Rock Island railroad, in Little Rock. Work is progressing on it and within 60 days asphalt will begin to be laid.

At the far end, a little farther south than Spring Lake, where the road was a trail which wound through the woods, the roadway is cut through the woods and made straight. Of the four and one half miles constructed from Spring Lake south, one mile was saved over the old road by making short cuts.

Shortening of the road, eliminating steep grades, removing dangerous curves, and lifting the road out of danger of flood water, are some of the problems that Lund & Hill, engineers for the district, had to solve.

Possibly the most serious of these was the raising of the roadbed in the Fourche River bottoms. Here for a mile and a half the roadbed is being raised on an average of five feet over the old road to avoid any danger of high water. To do this thousands of yards of earth must be used.

Ordinarily the earth is taken from the side of the road, or ditches are dug and the excavated earth used on the roadbed, but if more is needed land owners were found who were glad to give the dirt from



Scene on Warren County, Mississippi, Highway, Showing Old Road on Left.

their property. On a vacant lot not far from the Rock Island railroad was plenty of earth. The owner of the lot thought it would be a fine plan if the engineers would take off enough earth to make the lot level and the engineers as gladly consented. Consequently part of Fourche river bottoms are filled with the earth from a city lot and the lot is now level.

However, there was not enough earth on this lot to raise the roadway the required height and the remainder will have to be thrown up by a steam shovel from the sides of the road.

The road will cross the Fourche river on a steel bridge 200 feet long of two spans. Preparations were begun recently to build the abutments for the bridge 200 feet long of two spans. Preparations will be a concrete bridge 40 feet long. The bridge over the river will be two and a half feet higher than the present bridge.

At Lorange hill the road cuts off and eliminates the steep grade now there. The old road, running deep between high banks, had sunk to blue clay strata. In rainy weather, it is almost impossible to climb the hill so slippery and slick is the clay.

No grade on the new road will be over a five per cent, a grade which raises five feet every 100 feet. The old road has several hills which average 10 per cent grade and in places reach as high as 18 per cent.

Where the old road crosses the Rock Island near Little Bauxite it is planned to have the road run where the railroad now is and the railroad run where the road is. This will eliminate two crossings that are only a short distance apart. "It is coming through all right," said an engineer of Lund & Hill, "but I suppose the railroad has all kinds of forms to be gone through with before the change is made."

ROAD EQUIPMENT FOR KENTUCKY.

War equipment worth \$900,000 for use in the state road-building program has been turned over by the War Department to the state of Kentucky, according to a letter forwarded to Dr. Clarence J. Owens, director general of the Southern Commercial Congress, by Joseph S. Boggs, state highway engineer, who says that to date Kentucky has received the following machinery and other equipment.

One Hudson Super Six, one Buick Six, one Buick Four, eleven Ford ambulances, twenty-six Ford touring cars, seven G. M. C. ambulances, six Ford light delivery trucks, thirty-three 3-ton Peerless trucks, one 5-ton Hulbert truck, 157 2-ton Nash trucks, nine 1 1-2 ton Kelly-Springfield trucks; thirty-four 3-ton Kelley-Springfield trucks, one 3 1-2 Gram Bernstein, one 5-ton Garford, eleven 2-ton Denby trucks, sixty-four 1-ton F. W. D. trucks, three 1 1-2-ton G. M. trucks, two 3-ton Federal trucks, one 2-ton Wilson truck, one 3-ton Armleder truck, six 2-ton International trucks, eleven 2-ton Pierce-Arrow trucks, eighteen 3-ton heavy aviation trucks, six 3-ton Packard trucks, making a total of 359 trucks. Other material received includes twenty shovels, E. D. pattern; four sprinkling wagons, one road grader, one road grader an orange bucket, 6 dump wagons, two elevated graders, six concrete hoes, one concrete tamp, one road plow, five wheel barrows, seventeen grubbing hoes without handles, seventeen picks without handles, one doubletree, two

singletrees, one concrete mixer, one concrete mixer boiler, one Ransom concrete mixer on steam hoist, 350 double sets leather harness, one box steel tapes, eight steam drills, five carbide flare lights, one air drill, eighty-two sets single harness, eight hand pumps, thirty-seven escort wagons, 221 stable brooms, one reel, 696 feet of three-quarter inch cable wire with hemp center, 200 railroad lanterns, nine water carts, one 1-ton Cyclone chain, seven sets double harness, eighty-nine boxes Peerless spare parts, 1,536 sheets corrugated steel, ninety-five Nash Quad springs, two boxes Nash transmission parts, seven boxes spare parts of Ford automobiles, a large lot of cast iron pipe; total value \$816,494.

In commenting, Mr. Boggs says:

"Practically every county in Kentucky has received three trucks; most of them have been put in running condition and have been equipped with dump bodies. It is impossible to give a report of the amount of work which has been done with trucks, as they have been used in county work, however, practically every truck has been used every working day since March.

In addition to the trucks issued to the several counties, the state has held fifteen 3-ton Peerless trucks for use on convict labor. These have been equipped with hydraulic hoist dumps bodies and have been in use since the first of the year. This department also has two 2-ton Pierce-Arrows and nine 1 1-2-ton Kelley-Springfield trucks, which are being equipped for maintenance work."

IMPORTANT BRIDGE CONTRACT LET.

At last a contract has been awarded by the Florida State Board Department for the construction of the highway bridge across the Blackwater river, at Milton, Santa Rosa county, on State Road No. 1, and thus another "missing link" in this important across the state highway is to be filled in with a permanent type of construction.

The contract was awarded to the Pensacola Shipbuilding Company, of Pensacola, contractors, for the steel superstructure for the bridge. The amount of the contract is \$75,600 and calls for the completion of the superstructure ready for traffic and operation within eight months from date of the signing of the contract.

The foundation piers are now being constructed with day labor under supervision of a resident bridge engineer of the state board department. They are of concrete, reinforced with steel, and it is estimated will cost approximately \$45,000.

The bridge will be 338 feet in length and will have a bascule lift span over the channel, as the stream is navigable for some distance above the bridge.

For more than two years there has been no bridge across the Blackwater river at this point. The bridge that formerly spanned the stream was carried away during a storm and since that time the only method of crossing has been by a flat boat ferry with a capacity of three average size automobiles.

Madisonville, Ky.—Judge Crick, Road Engineer Poole, and Magistrate B. E. Lafoon went to Dawson Springs where they conferred with government officials regarding work on the county road leading to the sanatorium site and a satisfactory agreement was reached.

Sanitation of Prisons and Prison Camps

By DR. CHAS. E. LOW

TO THE CASUAL observer it may often seem that the modern public health official is forcing his propaganda into unnecessary places, but his work touches the various conditions of society at so many points that he can often justify his seemingly unwarranted activities by reasons easily explained.

At first thought it might seem to be out of place for a public health official to address a meeting devoted to the interest of good roads on the subject of jail or prison camp sanitation, but I am sure that if you will bear with me for a few minutes, I can convince you that there is an important relation existing between prisons and prison camps, and the construction of improved highways.

We may leave out of this discussion any question as to whether it is a good or bad economic policy to employ prison labor in industrial occupations in which it competes with the skilled trades, and will offer only a defense of the practice of working convicts on the public highway. Such defense may be summed up in the statement that prison labor does not compete in the labor market under ordinary conditions of road construction because of the fact that prison labor is employed in the building of improved highways which could or would not be built if labor had to be hired for work at current market prices.

The prospect of hard labor on a chain gang no doubt has a wholesome restraining influence on that class of moral delinquents who will commit petty crimes to secure idleness with wholesome food and comfortable quarters in a well regulated modern prison. For those of this class, as well as for others who fall into the clutches of the law, the regular hours, the systematic labor in the open air, and constant discipline are excellent means for restoring them to more useful lives. If it is granted that prisoners should be worked instead of being supported in idleness and that prison labor affords a practical means of accomplishing what might not otherwise be obtained, it is reasonable to suppose that we should adopt such measures as will secure its utmost efficiency.

It is becoming more and more apparent to all employers of labor that its efficiency depends very greatly on its health. This being so perfectly apparent, it is rather remarkable that employers of labor did not earlier recognize the economic advantage arising from better feeding, better housing and in general better sanitation for employees. The increase of efficiency due to better health applies to prison labor as well as any other kind. Because a man happens to be suffering a penalty due to infraction of the law is no reason why he should be either more or less efficient as a machine than another man of like type under other conditions.

Imprisonment for disobedience of law may be accepted as necessary from several view points. The old idea of making a prisoner's life so horrible as to deter the commission of crime is gradually becoming obsolete. Society is slowly reasoning out that a person who will deliberately undertake a crime will also take a chance on being caught, jailed and physically punished,

as part of the gambling chance involved in the act. If we honestly believe that the prisoner is not susceptible of moral improvement and consider the jail sentence necessary solely from the point of removing him as a menace to society, then every convict should have a life sentence. On a hypothesis that he cannot be improved in character, is it not illogical to turn him loose to again prey upon society after a prison term of a few days, weeks, months or years?

I prophesy that the study of criminal psychology will result in the establishment of prisons akin to insane hospitals where the incorrigibles will be restrained for life and where those showing criminal tendencies susceptible of correction will be restrained only until a vast increase in human efficiency can be brought about by discipline and hygienic living in sanitary environment. If this increased efficiency can be made possible by military discipline under the somewhat primitive conditions surrounding military camp life, such time as they may be morally re-educated and returned as useful members of society.

One of the lessons which the horrible world war is teaching us is that a large part of the race or at least a large part of our young American manhood is not physically fit for military duty. It is also teaching us what it can be equally so under prison discipline in both prison and prison camp.

Our State Law very sensibly requires that all prisoners admitted must be examined by a physician and those showing evidence of tuberculosis or other communicable disease must be removed from any possibility of infecting the well. The State law also requires the vaccination of all prisoners against smallpox as it should also require against typhoid fever, two preventive measures concerning whose wisdom and usefulness there can be no question.

All prisons should be so constructed that the cells and corridors may have ample light and air, nature's best disinfectants and invigorators, and also sufficient room for physical exercise. Each inmate should be allowed at least four hundred cubic feet of air space in sleeping quarters. Each corridor or preferably each cell should be provided with a proper flush closet. If public water supplies and sewers are not available private plants should be installed. Water may come from an uncontaminated spring, stream or deep well. In any event it should be tested from time to time as to potability. Private sewage disposal plants are so reasonable in cost and successful in operation that there should be no excuse for not having one in every public institution, or private home either for that matter, where city sewers are not available.

Heat, best supplied from a central steam or hot water plant, should keep the cells and corridors at a mean temperature or sixty-eight degrees F., and in connection with such heating there should be installed a ventilating system able to supply at least fifty cubic feet of fresh warm air per minute to each inmate.

The plumbing installation should include at least one lavatory and one shower bath for every ten inmates; also a steam laundry of sufficient capacity for the cleansing and sterilization of all clothing and bedding of the inmates. In connection with this laundry

a steam chamber could well be provided for the steam sterilization of unwashable material.

The building throughout should be constructed of brick or concrete and steel so far as funds will permit, not only that it may be of fireproof or slow burning construction, but that it may also be rodent and vermin proof. Floors, ceilings and walls should be of cement or water proof materials so that they may be easily washed down. The bunks may be in tiers for economy of floor space, if the proper amount of floor and air space is allowed. All bunks should be of metal construction to avoid harboring vermin, various forms of which are known to transmit diseases.

Every prisoner should be given a hot bath and clean clothing on admission, and continual personal cleanliness of inmates should be a part of the routine prison discipline.

A cell or group of cells which can be completely isolated should be provided for the reception of any contagious disease which might develop after a prisoner's admission.

Food, though it may be cheap and coarse, should be of a quantity and character necessary for one expected to labor. The kitchen, of cement finish throughout, should be modernly equipped with facilities for easy cooking and serving of food, preferably it should have mechanical dish washers, and an abundant supply of hot water is indispensable. A light dry and airy store room should be provided with proper refrigeration and suitable containers built well above the floor for the storage of foods. In kitchen and store room, as well as throughout the prison, rodents, vermin and the fly should be exterminated. Swat the fly, trap the fly, screen the premises and destroy his breeding places.

In so far as possible the sanitary rules governing a prison should also govern a prison camp. Where feasible in a temporary stockade, the men are perhaps better kept in tents than in portable cells on wheels. If the latter are used, care must be taken not to over crowd them and each must be provided with adequate ventilation and some form of fly proof closet pail.

Not only for the protection of the camp itself, but also for the protection of the general public as well, it is necessary that the most rigid precautions be taken concerning the disposal of human excrement. The pits should be dug at least two hundred feet from any water supply and not less than four feet deep and of other suitable dimensions. Over each pit a suitable box and fly proof seat should be built. The contents of

such a pit should never reach nearer than within two feet of the surface of the ground, when it should be filled in with dry earth. Before filling this pit, and at daily intervals during its use, the contents should be thoroughly covered with freshly slacked lime. No prisoners should be allowed to answer the calls of nature elsewhere than at such temporary closets, which should also receive all garbage and the contents of all sanitary cans.

Particular care should also be exercised that the camp water supply comes from a source uncontaminated by farm outbuildings or other sources, and that those in the camp itself do not pollute it.

At camp, as at prison, every means should be employed to destroy the fly and prevent its breeding. Par-



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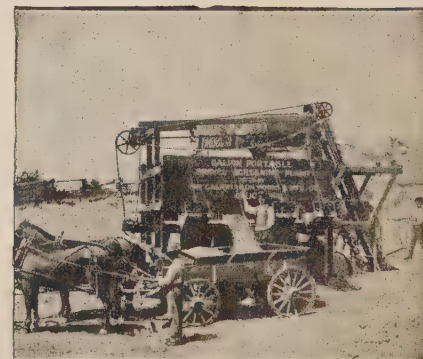
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NORTH CAROLINA



ticular attention should be paid to garbage and manure piles as breeding places. The manure should be removed at least weekly to a distance of not less than one-half mile, where it should be thinly spread.

This, gentlemen, is a short resume of why and how prisons and prison camps should be sanitated. I hope it may be considered a pardonable pride with which we point to the high score of one hundred which our local prison and stockade obtained at the hands of the State officials.

New Hanover's prisons and roads make a good showing. Perhaps some relation between the former and the latter may now be appreciated.

Good Roads Notes In Brief

Danville, Ind.—Contracts were let for improving five roads in Henricks county, under the Three Mile Road law. The total amount of improvements contracted for will be \$211,588. The roads are as follows: C. E. Wilson road, Marion township—Brewer road, Franklin township—Mercer road, Eel River township—Airhart road, Brown township—Surber road, Middle township—Cutrell road, Washington township.

Benton, Tenn.—The Polk County Court voted unanimously \$100,000 for each of the two proposed highways, the one from Prendergrast to Tennga as a part of the proposed Jackson highway from Knoxville to Atlanta, the other from this highway south-eastwardly to Hunters Switch, north of Ducktown, formally designated at a recent session of the court the Kimsey Highway.

Byron, Ill.—The proposition for bonding Lafayette township for \$14,000 for hard road purposes carried.

German engineers, following the war, are said to have perfected remarkable improvements in the making of roads, states Motor Life. They are utilizing the scrap of rubber factories in the making of a new composition for roads. The result is said to mean greater speed for vehicles, longer tire and gasoline mileage, and long periods without need for repair of the road.

The good roads movement has been given tremendous impetus in Northern Ontario by the recently completed 1,400 mile tour of boosters held under the auspices of the Michigan Pikes association.

Jackson and Howard counties in Arkansas decisively defeated candidates running on tickets opposing good roads, according to primary returns from those two counties. John H. Keel, a prominent politician and former state senator, made the race in Jackson for state senator with a platform opposed to good roads, and was defeated by a big majority. In Howard county, the opponents of hard surfaced roads put out an entire ticket for all county offices, but succeeded in electing only one of their number.

Road working day in the old-fashioned way was participated in by business men and others in Lockhart, Texas. Business houses and offices in Caldwell county generally were closed for the occasion. It is said that hundreds of men put in a full day's work on the roads, which it is thought resulted in much good to the roads.

G. K. McMahon, local engineer of the Kentucky State Highway Department, together with a field party of 25 men began a survey of the Richmond

and Harryville road at the city limits of Richmond and will continue on this survey of almost 200 miles through Paint Lick, Lancaster, Danville, Lebanon, Taylorsville, and Greenville to Hardyville in Hart

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Highway Primer

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RALEIGH, N. C.

Price 50 Cents Each

A book for schools, taxpayers, auto dealers, road builders, contractors, county commissioners, foremen, etc. List of road officials in every State Highway Commission in United States.

county, where the road connects with another federal aid road from Louisville south.

Two contracts for highway construction have been awarded under the supervision of the Oklahoma State Highway Department. Allen & Harrison were given contract for construction of six miles of gravel road in Comanche county for \$73,401, and Gibson & Mitchell of Pauls Valley secured contract to construct a mile and three-eighths of concrete road in Kingfisher County for \$58,797.

Spurrier, Ellis and Smither of Owensboro secured the contract to grade and drain 13 1-2 miles of road in Meade county, Kentucky.

The Madison county, Ala., board of revenue has awarded a contract to the Austin Brothers Bridge Company of Atlanta for the construction of a new bridge over Flint river on the New Hope-Hobbs Island highway to replace the bridge which collapsed in April after the spring floods. The new structure will cost \$12,000 and it will be 120 feet long and wide enough for two roadways. Since the old bridge collapsed traffic has been ferried across the stream and a bridge is badly needed.

Contract for the completion of the Garrison avenue bridge at Fort Smith, Ark., which was abandoned some time ago by M. M. Elkan of Macon, Ga., has been re-let by the Sebastian Bridge Commission to the Missouri Valley Bridge and Iron Company of Leavenworth, Kan., at a figure in excess of \$450,000, although the exact amount of the bid was not made public. About one-third of the bridge is completed.

The Fiscal Court of Fulton County, Ky., has passed resolutions recommending a bond issue of \$500,000 to build hard surfaced roads in Fulton County.

Ben Weille, Paducah, member of the State Highway Commission, and M. Holonsworth made speeches at a meeting attended by citizens of every Magisterial District and a delegation from Lake County, Tennessee. D. B. Wilson, wealthy planter served a big spread at his home, eighteen miles from Hickman.

Bids for the construction of hard-surface roads in Kingfisher and Comanche counties were opened at Oklahoma City recently.

WIDEN FLORIDA COUNTY ROADS.

The widening to sixteen feet of some fifty-five miles of nine-foot paved main roads in Pinellas county, Fla. was the decision reached at the meeting of the Pinellas County Board of Trade.

The resolution as adopted calls upon the board of county commissioners to proceed with this program, and suitable representations will be made at the next meeting of the commissioners to bring about the much desired result. It is not anticipated that there will be much, if any, difficulty in securing the support of the county commissioners, because public sentiment is demanding the improvement.

EASTLAND ROAD WORK PROGRESSING.

More than 500 teams are engaged in grading preparatory for the construction of Eastland County's \$5,000,000 good roads system in Texas.

The doctor has a better chance to save lives if good roads shorten the distance from office to farm.

The BEST CULVERT For Good Roads

We sell direct
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Prices



Used by Practically
all the cities, coun-
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The Point—COST LESS AND LASTS LONGER

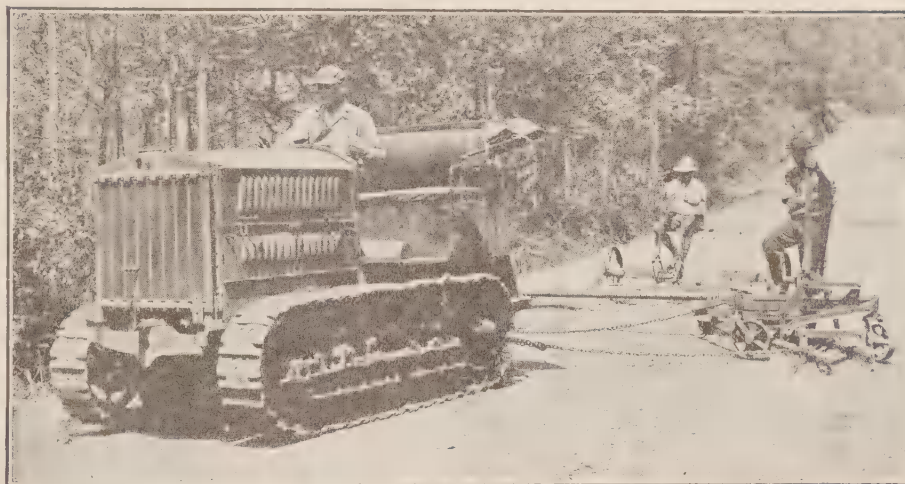
Our Vitrified Shale Rock Culvert Pipe Will Last 50 Years—and Longer.

All Culverts furnished by us will be replaced free at any time which give away, disintegrate or rust, or otherwise fail when the same have been properly installed according to the usual and accepted manner for installing same.

POMONA TERRA-COTTA CO., Pomona, N. C.

ANNUAL CAPACITY, 2,500 CAR LOADS.

"CATERPILLAR" TRACTORS REG. U.S. PAT. OFF. and Road Maintenance



SYSTEMATIC maintenance is the price of good roads. Dragging after rains is necessary to really fill the ruts, cut off the humps and provide the drainage necessary to maintain the proper road surface. Road builders everywhere have found in the "Caterpillar" the one really dependable power for road-building. On road maintenance the 5-Ton "Caterpillar" with a road maintainer or drag will work 15 to 30 miles of road per day. Where cuts and fills are necessary, the "Caterpillar" Tractor with the "Caterpillar" Land Leveler provides the most economical method for moving the dirt—a 6' Leveler with a 5-Ton Tractor or an 8' Leveler with a 10-Ton Tractor, depending upon the size of the job to be handled.

Sumter County, Georgia, is using one of their 5-Ton tractors on road maintenance work. Pulling a road maintainer, the 5-Ton "Caterpillar" is single dragging 30 miles per day or double dragging 15 miles per day. This outfit is replacing 16 mules and 8 drivers with a saving of \$1.32 on every mile of road dragged. Everywhere roads are built and maintained, "Caterpillar" Tractors are found substantially reducing the daily and yearly cost.

"Eight Years and Still Going"

Cissna Park, Ill.

"The satisfactory service received from our 'Caterpillar' Tractor purchased in 1911 may interest you. An accurate account has been kept of the miles graded and the total cost, and the tractor has certainly paid for itself many times over and given us the best roads in our County. I cannot see why we cannot get eight more years' service out of it, but if this tractor ever does wear out, our next one will certainly be a 'Caterpillar.'"

Geo. Keidel, Commissioner,
Pigeon Grove Township"

Our exclusive trade-mark—"Caterpillar" registered in every country, protects every buyer and insures Holt standardized service

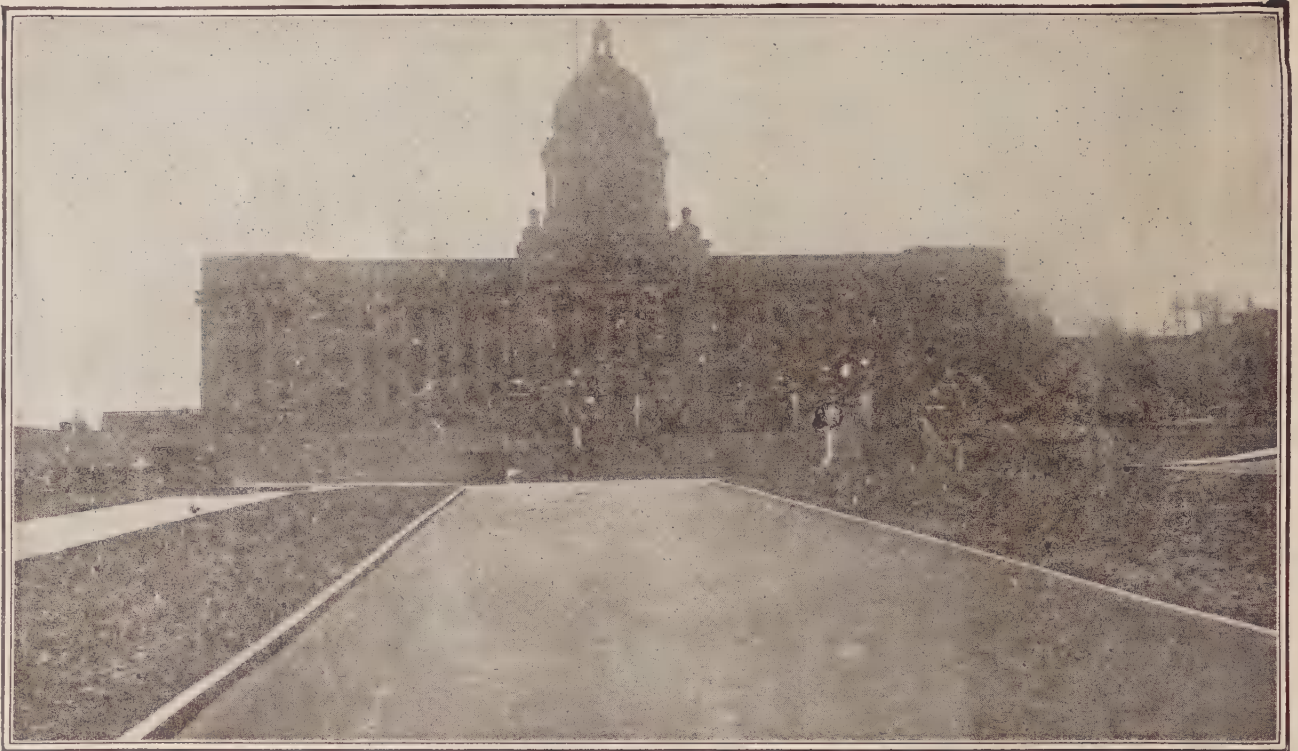
There is but one "Caterpillar"—Holt builds it

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New York, N.Y. Spokane, Wash.



ROAD PAYS FOR ITSELF

In one or two more years the State of Kentucky will have saved enough on maintenance of the roads about the State House to pay the original cost of paving with Kentucky Rock Asphalt in 1916.

The Kentucky Rock Asphalt driveways replace a macadam road which cost from \$1,500 to \$1,800 per year to maintain. The asphalt road is better today than it was when it was first laid, and has cost nothing for repairs.

Kentucky Rock Asphalt is super-asphalt. Its mineral aggregate is an irregular silica sand so hard it readily cuts glass. The natural bitumen, which binds the sand together, coats each grain perfectly. Because it is not heated or cooked, the bitumen never loses its life.

Kentucky Rock Asphalt is absolutely waterproof. It does not crack, roll, buckle or bleed. It offers a clean, dustless and non-skid surface.

BEST ROAD—LEAST COST

Kentucky Rock Asphalt produces a road surface second to none. Ordinary mixed asphalts have carried the heavy city traffic for years. It has been the favorite surface for residential streets because of its cleanliness and quiet. Kentucky Rock Asphalt possesses these qualities and more—

Its mineral aggregate is the hardest sand known.

It never loses its life.

It is an absolutely fool-proof material, which involves none of the risks of failure due to improper mixing and heating.

Kentucky Rock Asphalt comes ready mixed—ready to lay cold on any good base by ordinary unskilled workmen.

While we do not sell Kentucky Rock Asphalt on price, the great saving in machinery and skilled labor required for other types makes the first cost considerably less than that of other first-class pavements.

This, together with the enormous saving in maintenance, justifies our claim that Kentucky Rock Asphalt builds the best road at the least cost.

A card will bring you our booklet E. Every engineer, official or others interested in good roads should have this interesting story of Nature's own pavement.

Kentucky Rock Asphalt Company, Inc., 716 Paul Jones Building
LOUISVILLE, KY.

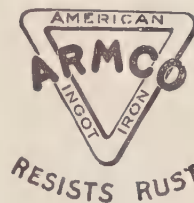


The Wrong Way

Certainly this is the wrong way and it is NEVER to be recommended that any Culvert be installed in this manner.

However, it does illustrate the STRENGTH of Armco Iron Culverts, for this Armco Pipe has withstood hammering for years and years.

Would Any Other Culvert Serve As Well?



Remember
the
Triangle



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AGASCO ROAD OIL

seals moisture in concrete roads and prevents drying until concrete is set thoroughly.

AGASCO PAVING PITCH

filler and cushion for brick, wood-block or granite cube pavements—Does not crack, crumble or shrink.

AGASCO Preservative Paints: Number Nineteen (for metal) and Number Fifteen (for wood) protect bridges against the elements.

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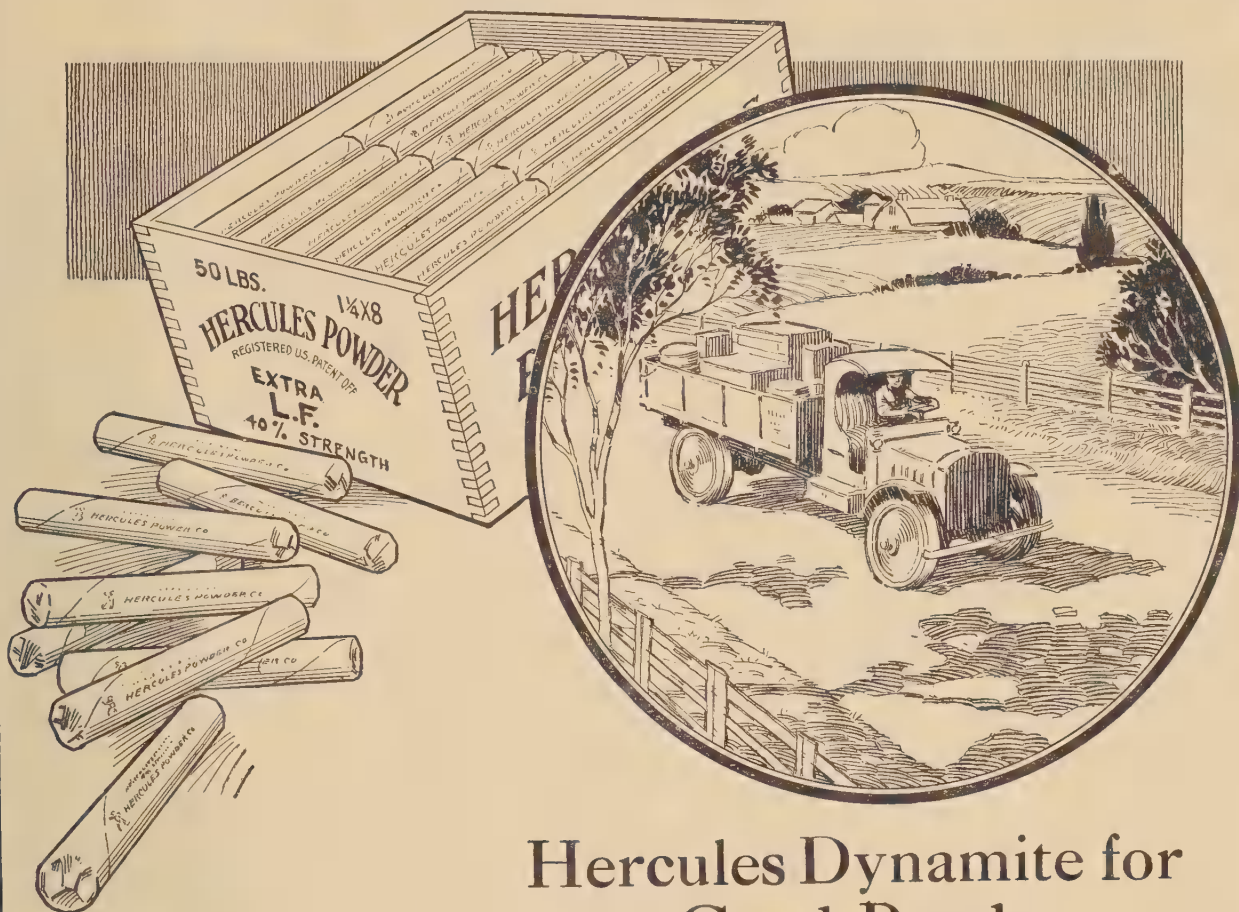


An 18" Diameter "GENUINE OPEN HEARTH IRON" Culvert Pipe in use on the Weldon-Jackson Highway in Northampton County, N. C. Photograph taken Feb. 17, 1916.

THE photograph above gives an excellent idea of the resistance of "Genuine Open Hearth Iron" Culverts to extraordinary wear. It is not often that a Culvert of any type has to withstand the direct wear and tear of the heavy traffic coming in contact with the bare surface, but such is the case in this instance. This Culvert has been in use since the Fall of 1910, and as the picture was taken February 17, 1916, you can readily understand that it must have had rather hard knocks in that length of time. Our Mr. J. H. Slagubter took this photo with a kodak and states that not only was this Culvert exposed in the manner shown, but at least a dozen more on the same road were installed under like conditions and have been subjected to the same rough treatment for the past few years.

We not only claim superiority for the material of which our Culverts are made, but also superiority of workmanship, and therefore of the lasting qualities of our Pipe. We manufacture only one grade of "Genuine Open Hearth Iron" Pipe and have no seconds to offer in this material. Being a high grade material, it costs us more money than the ordinary grade of Galvanized Steel, and quite naturally we have to secure a better price for it. Therefore, beware of cheap Culvert Pipe.

The Newport Culvert Company Inc., Newport, Ky.



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Hercules Dynamite is helping thousands of highway engineers and contractors to solve the great variety of problems that face them.

With the help of Hercules Powders these men are grading roadbeds—driving cuts and tunnels through hard rock—ditching swamps and clearing right of ways in every part of the United States. In fact, Hercules Explosives are a very important factor in the present drive for good roads.

The high and uniform quality of these powders—their reliability and great efficiency under all blasting conditions—make them particularly adaptable for road work.

If we can help you with your blasting problems write us. Our service staff will answer your questions promptly and fully.



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—and repeat orders

In 1909 only 444,000 square yards of **CONCRETE** roads, streets and alleys were placed under contract.

In 1919 *one hundred and twenty times this total—more than 53,000,000 square yards—were placed under contract.*

Since 1916 contracts for concrete roads, streets or alleys have been let in *every state each year.*

Once Concrete Means More Concrete.

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SIXTH ANNUAL CONVENTION AMERICAN ASSOCIATION STATE HIGHWAY OFFICIALS,
WASHINGTON, D. C., DECEMBER 13-16TH, 1920

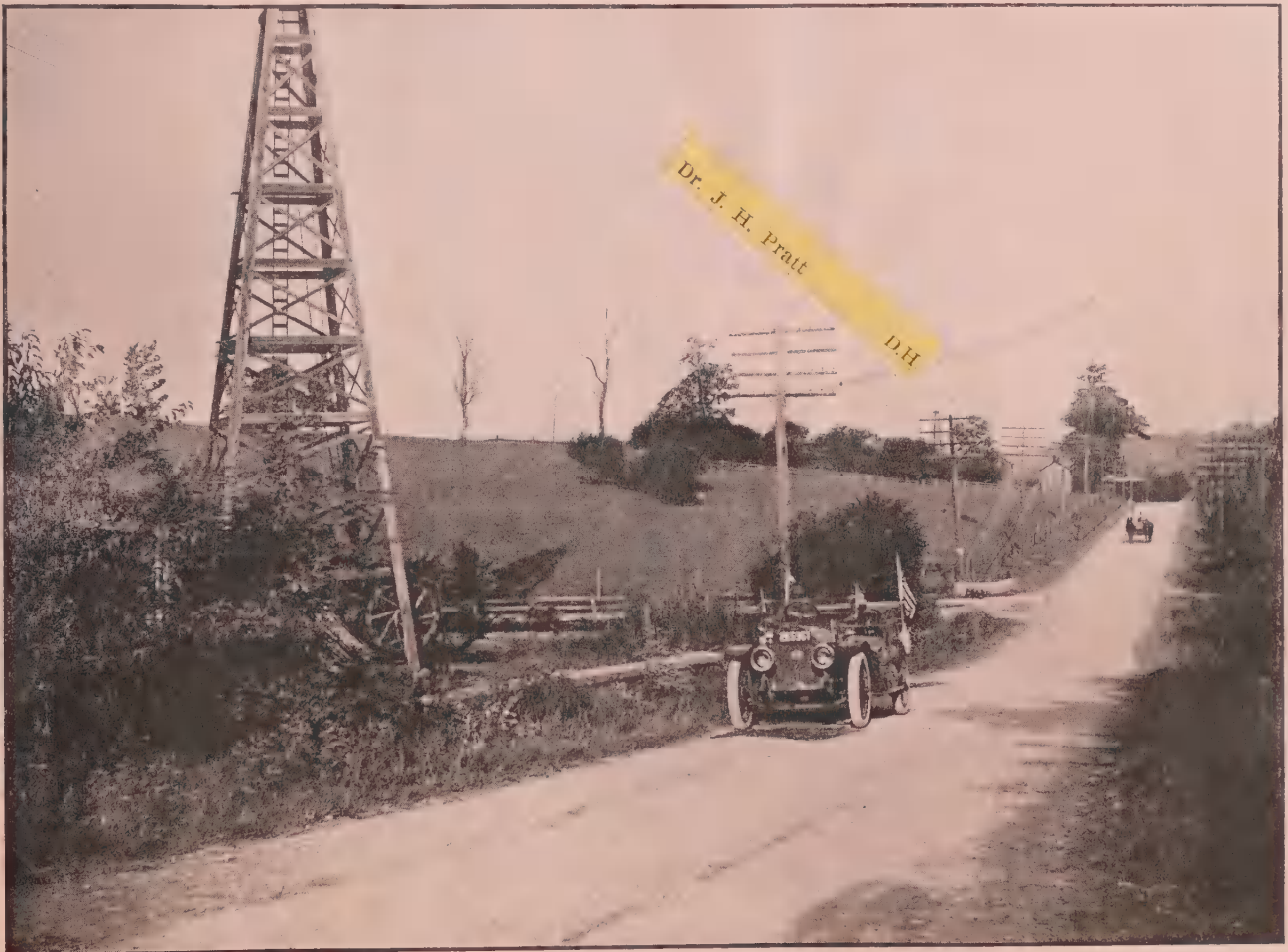
SOUTHERN GOOD ROADS

HIGHWAYS - STREETS - MOTORING

Vol. XXII

Lexington, N. C., December, 1920

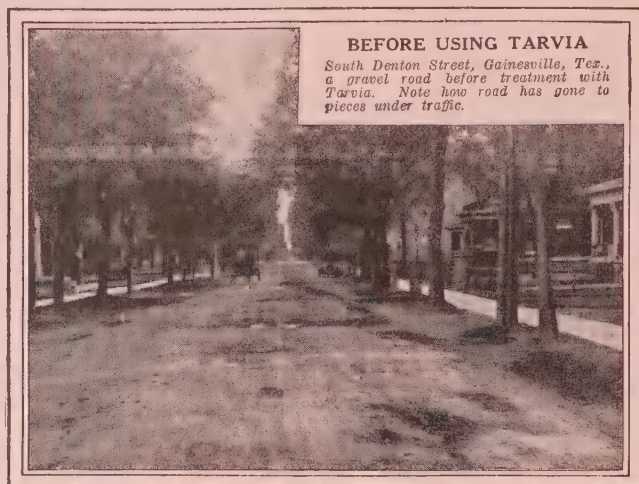
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A Fine Macadam Road Near Wheeling, West Virginia

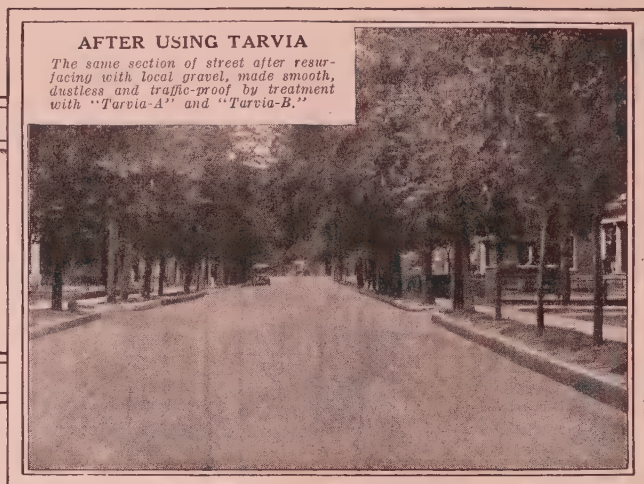
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BEFORE USING TARVIA

South Denton Street, Gainesville, Tex., a gravel road before treatment with Tarvia. Note how road has gone to pieces under traffic.



AFTER USING TARVIA

The same section of street after resurfacing with local gravel, made smooth, dustless and traffic-proof by treatment with "Tarvia-A" and "Tarvia-B."

"There are no arguments against saving what you've got"---

THE war taught us many things, not the least of which was thrift—pertinently termed "saving what you've got." Thrift showed us that last year's shoes could be resoled and that the old suit—with a little mending and pressing—had another year's wear in it.

It showed many cities and towns that the policy of "saving what you've got" could be applied to their road problems. They reasoned this way:

"High costs may offer good argument for delaying new road construction at this time, but **there are no arguments against saving what you've got.** To neglect the roads already built is waste, and waste is a crime."

If your macadam roads are good, keep them good; if they're in bad shape, **repair them!**

That may mean Tarvia patching and surface treating; the widening of narrow roads by adding Tarvia macadam shoulders, or it may mean utilizing the old macadam as the foundation for a traffic-proof Tarvia top.

Road improvements like these are not make-

shift methods. They are the logical solution of the good roads problem in hundreds of communities today.

Best of all, the cost is low, the maintenance cheap and the satisfaction a blessing to the entire community.

Tarvia roads are mudless, dustless, waterproof and frost-proof. The smooth-running durable surface resists the hardest traffic.

Our engineers will gladly consult with you, without obligation, in solving your road problems with Tarvia.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

Illustrated booklets of the various Tarvia treatments free on request. Address nearest office.



Gravel road in Bridgeton, Maine maintained with "Tarvia-B"

Tarvia

Preserves Roads—Prevents Dust

THE BARRETT CO., Ltd.

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SOUTHERN GOOD ROADS

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Association State Highway Officials

Sixth Annual Convention to be Held in Washington Hotel,
Washington, D. C., December 13-16th, 1920

THE sixth annual convention of the American Association of State Highway Officials will be held in Washington, December 13, 14, 15 and 16. A notable program has been prepared for the sessions, which will be held at the Washington Hotel. Many of the most notable road builders, scientists and public officials in the country will deliver addresses and take part in the discussions. Every State in the Union is expected to be represented and the men on the program come from every section of the United States, each bringing particular views on the big job of building good roads for the nation.

Paul D. Sargent, State Highway Commissioner of Maine, is president of the association; W. S. Keller, State Highway Commissioner of Alabama, vice president; John H. Mullen, deputy commissioner of Minnesota, treasurer, and Joseph Hyde Pratt, of North Carolina, secretary. George P. Coleman, State Highway Commissioner of Virginia, is chairman of the executive committee.

The following program has been arranged for the four days session:

Monday, December 13, 1920—Morning

9:00 a. m. to 10:30 a. m.—Registration of Delegates.

10:30 a. m.—Sessions commence.

President Paul D. Sargent, of Maine, presiding.

Prayer.

Address of Welcome by Hon. E. T. Meredith, Secretary of Agriculture.

President's annual address.

(1) Traffic Census—How to classify vehicles—Suggestions for determining what type of surface is suitable for different classes of traffic—A. N. Johnson, director of engineering research, Maryland State College, College Park, Maryland.

Discussion by A. W. Dean, chief engineer, division of highways, Department of Public Works, Boston, Mass.

Discussion by A. B. Fletcher, chief engineer, State Highway Department, Sacramento, Calif.

Afternoon—2:30

Vice-President, W. S. Keller, of Alabama, presiding.

(2) What has been accomplished under Federal Aid?—Thomas H. MacDonald, chief of bureau of public roads.

(3) Analysis and preparation of estimates—H. J. Kuelling, construction engineer, State Highway Commission, Madison, Wis.

(4) Report of Committee on Use and Care of Federal Equipment. Committee: John N. Edy, chairman, chief engineer, State Highway Commission, Helena, Mont.; R. J. Windrow, state highway engineer, State Highway Department, Austin, Tex.; G. H. Piepmeyer, construction engineer, State Highway Department, Springfield, Ill.

Discussion.

Tuesday, December 14—Morning, 9:30

S. E. Bradt, member of executive committee, presiding.

(5) Load limitations for primary and secondary highways—C. J. Bennett, State Highway Commissioner, Hartford Conn.

Discussion by Thomas Maddock, State Highway Engineer, Phoenix, Ariz.

(6) Researches leading to the adequate design of road surfaces for heavy motor trucks—A. T. Goldbeck, testing engineer, Bureau of Public Roads.

Discussion by W. D. Uhler, chief engineer, State Highway Department, Harrisburg, Pa.; A. B. Fletcher, chief engineer, State Highway Department, Sacramento, Calif.; Clifford Older, chief highway engineer, Springfield, Ill.

(7) Study and treatment of sub-grade and foundations—Charles M. Upham, chief engineer, State Highway Department, Dover, Del.

Discussion by John H. Johnston, division engineer, Massachusetts Highway Department, Springfield, Mass.; I. W. Patterson, chief engineer, State Board of Public Roads, Providence, R. I.

(8) Relative service value of different types of pavements—A. R. Hirst, state highway engineer, Madison, Wis.

Discussion by Frederick S. Greene, state highway commissioner, Albany, N. Y.

(9) Report of Committee on Tests and Investi-

gations—T. R. Agg, chairman, Iowa State Highway Commission, Ames, Iowa.

Afternoon

Automobile transportation to the Arlington experimental farm will be provided by the local committee. The excursion will start promptly one hour and thirty minutes after the close of the morning session. It is believed that every member will find this trip of the greatest practical value and interest. A synopsis of the experimental work being carried on will be furnished each member.

Wednesday, December 15—Morning, 9:30

Thos. H. MacDonald, Chief, Bureau of Public Roads, presiding.

(10) Difficulties experienced by the states in the matter of rail transportation—S. E. Bradt, superintendent of highways, Springfield, Ill.; George P. Coleman, state highway commissioner, Richmond, Va.; M. W. Watson, state highway engineer, Topeka, Kan.

(11) What may the highway departments expect from the railroads in 1921 in the matter of road building materials?—Daniel Willard, chairman advisory committee; president B. & O. railroad, Baltimore, Md.

(12) What conditions would warrant a state in purchasing and operating a portland cement plant?—H. E. Hiltz, assistant engineer, State Highway Department, Harrisburg, Pa.

Discussion by R. J. Windrow, state highway engineer, Austin, Tex.

(13) Modification of contracts to meet present conditions—Warren R. Neel, state highway engineer, Atlanta, Ga.

Discussion by Frederick S. Greene, state highway commissioner, Albany, N. C.

Thursday, December 16—Morning, 9:30

Austin B. Fletcher, of California, presiding.

(14) Organization of a state highway maintenance department—John N. Mackall, chief engineer, Maryland State Roads Commission, Baltimore, Md.

Discussion by J. H. Mullen, chief engineer, State Highway Department, St. Paul, Minn.; W. R. Neel, State Highway Engineer, Atlanta, Ga.

Afternoon—2:00

Paul D. Sargent, president, presiding.

Business session.

Reports of committees.

Election of officers.

Final adjournment.

Mexico, Mo.—A \$60,000,000 road bond issue was voted by the people of Missouri at November elections.

Gallatin, Tenn.—The engineering corps for the Jackson Highway completed the survey from Westmoreland to Red Boiling Springs in Macon county.



A Fine Bridge over the river in Pinellas County, Florida. This bridge is 2,392 feet long. The picture was taken from center of the bridge, looking East.

New Highways in Western North Carolina

More Than 167 Miles Now Under Construction at a Cost of Over
Two Million Dollars—95 Miles Completed

HIGHWAYS are now under construction, through state and federal aid, to the extent of 164.07 miles at a total estimated cost \$2,716,416.59 in the western division of the state, according to figures recently prepared by Wythe M. Peyton, division engineer for the state highway commission. In the same division, surveys covering projects totaling 195 miles have been completed, these projects to cost an estimated \$2,036,615.91, while there are yet to be surveyed proposed projects covering 114 miles, to cost an estimated \$1,296,429.16. This gives a total of 472.16 miles of highways either actually completed, under construction, or contemplated in the near future, the cost of the highway program to run into figures estimated as \$6,134,461.67.

Recently returned from extensive investigations in the field, looking over various projects, noting progress made, and laying plans for future surveys, Engineer Peyton gave in detail a comprehensive report of his findings.

Of particular interest in the county is his report on highway work now under way, showing that one of the most important outlets for Asheville, the Black Mountain highway, will be completed by January 1, unless all predictions fail. This project, known officially as No. 45, is a 7.71 mile stretch on the Central highway between Azalea and Black Mountain. The engineer estimates that it is now 70 per cent complete. A five-inch concrete base will be surfaced with two inches of asphalt top. The roadway will be 18 feet wide with a three-foot earth shoulder upon both sides. The project will cost an estimated \$353,834.79.

Just the opposite news is given out regarding the Hominy road, where a lack of materials has caused great delay in surface. The stretch known as project No. 63, a section of the Asheville-Murphy-Atlanta highway, extends 3.68 miles from West Asheville to Hominy. Grading is estimated to be 90 per cent complete, while small bridges and drains are now in place. It was originally expected that this section would be ready by the winter of 1920, but the Asheville Paving company, securing the contract, was instructed by the highway engineer to apply all possible materials and working forces upon the Asheville-Black Mountain highway when it was learned that only insufficient materials for both projects could be obtained.

Completed Next Year

This road will be completed during the spring or early summer of 1921, according to estimates, and necessary materials for the work are to be secured during the winter. When completed the highway will be 18 feet wide, a two-inch asphalt top over a concrete base, and will cost an estimated \$165,094.16.

Grading is reported 85 per cent complete, but surfacing materials have been hard to obtain so that it is not expected that the road, of asphalt penetration macadam type, will be ready before spring

or early summer. The estimated cost of this stretch is \$139,861.92.

When Buncombe county proved unable to finance the construction of two short sections upon the Asheville-Hendersonville highway, state and federal aid was sought. Known as project No. 31, and costing \$76,989.86, these sections, totaling 2.6 miles, have now been completed and accepted by federal authorities. The stretches were built of concrete, like the rest of the highway as far as the Henderson county line.

Another project completed and accepted is No. 2 in Henderson county, costing approximately \$33,144.74, being a 7.75 mile stretch of earth road between Buncombe county and the Rutherford county line on the Charlotte-Asheville highway. At a cost of \$28,691.06 a 2.9 mile stretch in McDowell



A Limestone Macadam Road in Virginia

county was also recently finished, on the same highway, running from the Buncombe county line east. This has been accepted by federal authorities, and is a graded road.

With the exception of a proposed underpass beneath the Southern railway tracks near Icard station, project No. 5, in Burke county, is complete, and will cost an estimated \$22,299.11. It is of top soil type, running 8.3 miles from the Catawba county line west, being a part of the Central highway.

Costing an estimated \$42,582.98, project No. 6, in McDowell county, has been suspended indefinitely, being a 7.67 mile stretch running from the Burke county line south on Marion-Newland highway.

Fully 90 per cent completion is reported for project No. 9, a 13.02 mile stretch of sand and gravel road in Polk county, on the Asheville-Spartanburg highway, running between the Henderson county line and the South Carolina line, thence with a spur from Tryon to Lynn. It is hoped to bring about the completion of the road in the next 60 days. The estimated cost is \$60,334.51.

Haywood County Project

Within a like time there should be finished, the engineer believes, project No. 16, in Haywood county, a 14.29 mile section of the Asheville-Murphy-

Atlanta highway of gravel and shale type, connecting Buncombe county and Waynesville. It is now reported 75 per cent complete, and will cost an estimated \$42,873.90.

Of top soil type, project No. 23, in Burke county, is about 92 per cent complete, being a 7.68 mile stretch on the Central highway through Lovelady township and should be finished within 30 days at an estimated cost of \$42,873.90.

Project 41 is an 8.95 mile section upon the Boone trail in Watauga county that has just been let to contract by county officials. It is to be of graded earth type and runs between the Wilkes county line and thence west toward Boone. It will cost an estimated \$118,357.69.

Running from Waynesville to the Jackson county line, project No. 66 in Haywood county comprises a 6.2 mile link of the Asheville-Murphy-Atlanta highway. It is to be of sanded and gravel type and is now in process of construction by the O'Brien Construction company, of Birmingham, Ala. While construction started but recently, there is now engaged upon the work a one-team outfit and a steam shovel on a caterpillar tractor. The link will cost an estimated \$83,343.83, and will probably be completed in the early spring.

Of sand and gravel type, project No. 69, in Transylvania county, comprises a 9.45 mile section of the Hendersonville-Brevard highway that has been under construction for some time by the Asheville

Construction company. Owing to a lack of labor and materials, together with poor weather conditions, the work has been seriously delayed. Grading work, although rough, is now 50 per cent complete. Drainage materials have been secured and the work is to be rushed to completion by spring or early summer. The cost, it is estimated, will be \$159,059.05.

Now under construction by Wright and Nave, of Anderson, S. C., project No. 70 A, comprises a 4.83 mile stretch of crushed gravel road running from the Haywood county line west, upon which the grading is about 50 per cent complete. Surfacing will start in the near future with the hope that the work, to cost about \$136,743.31, will be completed by spring or summer.

Highway from Sylva

Connecting with the project just mentioned, No. 70 G runs from the termination of the former to Sylva, a distance of 7.59 miles, forming a part of the Asheville-Murphy-Atlanta highway. Survey of this road, to cost an estimated \$136,743.31, has been completed and approved by the federal engineer, with every indication pointing to a letting of contract soon after January 1.

A portion of the Charlotte-Asheville highway, running through the town of Rutherfordton, a distance of 2.19 miles, project No. 77, has been held up by lack of materials needed in laying concrete pave-



A Section of the Jackson Pike, in Missouri.

ment that is to be 16 feet wide. E. T. Belote, of Asheville, has the contract and it is reported that drainage work is 75 per cent complete with grading only 40 per cent. It now appears that the surfacing cannot be completed before early spring, and will cost \$100,159.44.

Also a section of the Charlotte-Asheville highway in Rutherford county project No. 78 A comprises a 10.03 mile section running from the Cleveland county line west to Forest City. It will be of top soil type, and contract for the work was recently let to Ross brothers, of Fredericksburg, Va. The work to cost \$90,888.97, has been completed for two miles with indications that completion will be reached by early spring.

On the same highway, project 78 B comprises a 10.25 mile stretch connecting with 78 A on the east and running west to Green Hill. It will be of top soil and sand and gravel type, the work having recently been let to Ralph E. Oliver, of Knoxville,



Difficulties of Constructing Good Roads in Mountainous Sections

Tenn. A force has just been placed on the work, estimated to cost \$69,387.23, and completion is looked for this winter or by early spring.

Another 10 mile section on the Charlotte-Asheville highway is project 78 C in Rutherford county, connect with 78 B and running to within four miles of Chimney Rock. With the survey completed, plans are now being worked out at Raleigh and Washington for a sand and gravel road to cost an estimated \$69,387.23, contract for which will be let in the near future.

Another link in this highway is project 78 B, extending from 78 C to the Henderson county line, a distance of six miles. As yet this has not been surveyed, but arrangements have been made to place an engineer upon the work this week with the hope of having the construction let by the first of the year. It will be of sand and gravel type and will cost an estimated \$36,000.

Running through Cleveland county from the Gaston county line a distance of 1.88 miles through the town of Kings Mountain, project No. 79 will cost \$51,674.06, it is estimated, the work being now about 90 per cent complete. The Noll Construction company of Spartanburg, have this section, which is to be an 18-foot concrete base with two-inch asphalt-concrete top.

A 3.3 mile section of the Asheville-Murphy-Atlanta highway in Swain county is known as project No. 83, running from the Graham county line east, of sand and gravel type, upon which the survey has now been completed and plans are being worked out at the Raleigh office for an early letting of the contract. It will cost an estimated \$43,824.

A section of the Central highway in McDowell county, project No. 84 comprises 8.37 miles to be of top soil from Bridgewater to the Burke county line, thence west. Work is now under construction by the J. A. Kreis Construction company, of Knoxville, Tenn., with three team outfits at grading. The work is about 35 per cent completed and, according to the engineer, is being handled in a most satisfactory manner. One bridge outfit is also at work with the expectation that the link, estimated to cost \$128,193.77, will be completed by early spring.

Joining with project 84 A and running west to a point two miles west of Marion, project No. 84 B comprises a 6.78 mile link in McDowell county being handled by the same firm. The road, to cost \$110,362.62, is to be of top soil type and should be completed this winter or by early spring. Grading has recently been started.

A link of the Central highway, project No. 84 C in McDowell county connects with 84 B and extends west eight miles. The survey has recently been completed for the link which is to be of sand and gravel type. The contract for construction will probably be let in the near future, and will cost \$120,000, it is estimated.

Another Road Project

Another link in the same highway is project No. 84 D, a nine-mile section extending from 84 C west to project No. 3, which in turn connects with Buncombe county. Survey has been completed and the contract for construction as a gravel or crushed stone road, to cost an estimated \$160,000, should be let by this winter or by early spring.

Lying in Mitchell county as part of the Western North Carolina-East Tennessee-Southwest Virginia highway, project No. 94 A is a 5.04 mile stretch running from the Avery county line through Spruce Pine to a point one mile west of that town. It will be a 15-foot wide macadam road with a nine-foot natural rock asphalt surface. The grading is reported 40 per cent complete and the drainage 50 per cent, with about one-half mile of macadam base course now laid by the Gibson Construction Company, of Knoxville, Tenn. The work will cost an estimated \$142,796.39, and should be complete early in the summer of 1921.

Upon the same highway, located in Mitchell county, project 94 B connects with 94 A and ends at the Yancey county line. The section is 4.97 miles long and will be of natural rock asphalt surface on penetration macadam, to cost an estimated \$180,845.61. While the work was advertised August 10 all bids received were rejected owing to the belief of the highway commission that the figures were too high. New bids will be called for early in 1921, it is understood.

A 22.25 mile section of the Asheville-Murphy-Atlanta highway in Graham county is known as project No. 95 and runs between the Swain county line and Robbinsville. With the survey complete for the first six miles, the work was temporarily suspended although arrangements are being made to have an engineering party take up the survey with-

in the next few weeks. The link will be of sand and gravel type and will cost an estimated \$265,-086.25.

Gravel surface is to be used on project No. 96 in Yancey county, a link of the Western North Carolina-East Tennessee-Southwest Virginia highway, running a distance of 2.95 miles between the Mitchell county line and the South Toe river bridge, thence connecting with the graded road constructed by Yancey county in 1915. A working force will be placed upon the stretch at once by the Gibbs Construction company, of Knoxville, it is reported, the project to cost \$81,650.25.

Bryson City Link

A five-mile link of the Bryson City-Franklin highway is termed project No. 97-A running from the

been completed so that bids will be called for with the hope of construction starting early next year if the Macon county officials provide their portion of the funds. The cost is estimated at \$70,000.

Water bound macadam will be used in building project No. 100-A, in Avery county, a seven mile link of the Western North Carolina-East Tennessee-Southwest Virginia highway. Already the Southern Dray company has placed a construction force upon the road running from Cranberry to the west. It is hoped that this work will be completed by early spring, the cost estimated at \$148,426.63.

Another seven-mile link on the same highway is project No. 100-B in Avery county, connecting with 100-A and to be constructed of water-bound macadam by the Southern Dray company. This project will cost an estimated \$148,426.63.



A Well-Kept Road Leading in to Baltimore, Maryland

Swain county line to the south. This will be of shale and gravel type. Construction, however, has been held up although bids were received August 10. The officials of Macon county were unable to furnish their portion of the funds. Reconsideration of this project will be given by the commission just as soon as the county has funds available. The estimated cost is \$99,817.19.

Connecting with the project mentioned and running 4.9 miles as a portion of the Bryson City-Franklin highway terminating at the ending of the graded road built by Franklin township in 1915. This section will be of sand and gravel, the survey having

A link of the Dixie highway, 2.46 miles in length, is known as project No. 107, in Madison county, running between Walnut gap and the Laurel River bridge. This has been let also the Southern Dray company, with work recently started. The road will be of gravel or shale surface and should be completed by spring at an estimated cost of \$75,-333.50.

One in Cherokee County

Another link of the Asheville-Murphy-Atlanta highway is termed project No. 108 in Cherokee county between Tipton and Andrews, a distance of

7.57 miles. With the survey completed and plans now being worked out at Raleigh, construction estimated to cost \$65,587.50 should start early in 1921.

Running from Morganton east a 3.58 mile link of the Central highway in Burke county, project No. 109 connects with project No. 23, and is now under construction by Teague, of Columbia, S. C., who has the grading about 70 per cent complete, the bridges and drainage about 25 per cent, and the surfacing of top soil about 35 per cent complete. The underpass, however, has not been completed at Hunting creek crossing of the Southern railroad. A bridge will also have to be built at this point, but the work, costing an estimated \$54,924.65, should be completed in about 60 days.

Probably in the early part of 1921 project No. 115 in Henderson county will be let, this consisting of a 10.22 mile stretch of sand and gravel road between Hendersonville and the Transylvania county line. The survey is now complete and plans are being worked out at Raleigh, the estimated cost of the road placed at \$100,903.22.

Two sections, totaling 12.38 mile, are contemplated in Clay county as projects No. 118-A and 118-B, running from the Cherokee county line to Hayesville. The estimated cost is \$123,757.15 and plans for the work are now being prepared at Raleigh.

The same is true of project No. 130 in Caldwell county, a 15.72 mile section between Lenoir and the Catawba county line, that has already been surveyed. The cost is estimated at \$93,489 and top soil construction is contemplated.

Contract to Be Let

With the survey also completed, project No. 131 in Cleveland county will probably be let to contract early in 1921, being a 5.11 mile section running through No. 4 township between Shelby and the

Cherokee county line. The road, to cost an estimated \$37,299.68, will be of top soil type.

The same type is planned in Caldwell county on project No. 132, running from Lenoir to the Wilkes county line. This survey has been completed with the hope of having work start early next year.

Water bound macadam will be used on project No. 134-A in Watauga county, the work comprising a five mile stretch from the Caldwell county line to Blowing Rock and thence north toward Boone. The survey is complete. The work, to be let probably in the early part of 1921, will cost an estimated \$90,000.

The same is true of project No. 134-B, a 7.5 mile stretch to be of water bound macadam connecting project No. 134-A thence to the town of Boone. A survey party will be paced in the field at an early date, it is hoped. The cost is estimated at \$111,916.28.

Between Spruce Pine and Wakersville two contemplated links are known as projects No. 135-A and 135-B, to cost \$195,063. Gravel or water bound macadam will be used over the distance of 14 miles. Survey of 12 miles has been completed and the contracts should be let by early next spring.

Running from the Buncombe county line at the forks of Ivy by way of Ivy gap two miles in Yancey county, project No. 141 is a link in the Western North Carolina-East Tennessee-Southwest Virginia highway running near Swiss postoffice, a distance of 14.5 miles. Shale or gravel will be used in the work to cost an estimated \$158,645.96. The contract should be let in the early spring, it is estimated, as the survey has been completed some time.

Some Not Numbered

There are contemplated by the highway commission a number of projects that have as yet received



One of the Many Good Roads to be Found in Florida

no official numbers from Raleigh or Washington. A number of these have already been surveyed.

One such is located in Swain and Macon counties from Almond to the Cherokee county line, at Tipton, a distance of 17.93 miles to be of shale or gravel type and to cost an estimated \$260,000. It will be a link in the Asheville-Murphy-Atlanta highway.

Another project contemplated in Graham county runs from the Cherokee county line at Tipton to Robbinsville, some 13 miles. Survey of the road is about 60 per cent complete and will soon be rushed to completion with an ample engineering corps placed in the field so that the work to cost about \$130,000, may be let early next year.

Gravel or crushed stone will be used on a project in Ashe county between Jefferson and the Wilkes county line, a distance of nine miles. Survey, now 50 per cent complete, will be rushed so that the work, to cost about \$110,000, may be let early in the spring.

A 10-mile stretch is now under survey in Cherokee county between Murphy and the Georgia state line, with the survey work about 50 per cent com-



A Sand-Clay Road near Dodge City, Kansas

plete. Gravel is to be used at a cost of \$120,000 on this stretch and the contract let in the early spring if possible.

At an early date a survey will tackle a contemplated project in Yancey county on the Western North Carolina-East Tennessee-Southwest Virginia highway connecting project 141 with 96, a distance of 17 miles. It will probably be made of bituminous macadam or natural rock asphalt surface and will cost an estimated \$340,000.

In Clay county a project is proposed at a cost of \$40,000 in the construction of a five-mile stretch of gravel road between Hayesville and the Georgia state line. It is hoped to have the work surveyed in time for construction to start next spring.

The state highway commission, working in co-operation with Jackson county officials, has authorized engineering supervision for the construction of a 36-mile road between Sylva and the Transylvania county line near Cashiers. A state engineering party has been in the field staking out the construction work that is to be done by the county at a cost of \$40,000 for a graded earth road.

A similar course of action has been approved in Jackson county for the construction of a road from Sylva to the Macon county line, a distance of 15

miles. The state will have an engineering force upon this project at a near future date, it is hoped.

Women Road-Builders of Near East

Some of these days, along about 1922, tourists in the Near East are going to point to smooth, broad roads and say, "See those roads? Women built 'em."

For women are the road-builders of the Near East today. Whether they make better workers than the men is hard to say, but it is at least a certainty that under the stress of war-time conditions and the great need for thorough reconstruction, they are making great headway in Turkey and Armenia. In some places where the district has not been so thoroughly stripped of its men by warfare and the Turkish massacres, men are road-workers, too, but it is doubtful if as complete a program could be carried out without the women.

One of the interesting phases of the Near East Relief work is the strong hold which the American organization has taken upon the bad road situation there. Depending to a large extent for efficiency in the distribution of supplies on motor trucks, the condition of the roads naturally plays no small role in the organization activities. Therefore they have given employment to thousands of men and women of the refugee class, repairing the roads. The old Turks were good road-builders in the sense that they started a number of roads projects, but their difficulty was in finishing up the work. Another administration would enter in before the old one had completed his building program. Consequently present-day traffic with its heavy trucks and motors soon exposes the weak points in the old roads, while the destructive advance of enemy troops helped tear up the highways.

In Adana the Near East Relief gave funds for the improving of the roads, realizing that helping the victims of the war to rebuild their cities and roads for future peace was almost as important as feeding and clothing them. The relief organization paid the workers and the French government supplied rock, dirt and wagons for hauling. Shovels, picks and other tools were supplied by the Americans, but the lack of adequate implements and machinery for this repair work was a recognized handicap. In Ourfa and Aleppo, road building has been carried on in co-operation with the Arab government, the expenses being shared half and half, but the government withdrawing its support the work is now discontinued.

Last summer five hundred of the older children of the Caesarea Armenian orphanage were set to work to improve the road to the Eukere Monastery, and in other districts refugees and orphans were busily at work fixing the roads so that they might be accessible during the coming winter. In one region over 1,600 people are employed in road building, of which a large proportion are women.

It is probable, according to relief workers who have made a study of conditions, that the increasing popularity of motor transportation in preference to ox-cart and camels, will have its effect on inducing the Armenians and Turks to launch a "Better Roads" campaign on an even greater scale, once political conditions will permit them to look toward the future.

North Carolina To Take Another Step In Road Building

By MISS H. M. BERRY

Secretary North Carolina Good Roads Association

OUR State Legislature meets in January, 1921, and indications are now that legislation providing for the construction of a State system of hard surfaced roads will be the one overshadowing issue. The first decisive step toward laying out a State system of highways in North Carolina was taken in 1915 when the North Carolina Good Roads Association and the North Carolina Geological and Economic Survey succeeded in having passed legislation creating a State Highway Commission, with a State highway engineer at its head, with authority to cooperate with the counties in laying out a State system "connecting by the most direct and practical routes all county seats and other principal cities." With the very small amount of funds appropriated for this purpose, the Commission could do little more than act in an advisory capacity to the county road organizations. However, it was a beginning.

In 1917 legislation was enacted authorizing the State Highway Commission to take advantage of Federal aid and "to receive and disburse such funds as may be appropriated by the counties, individuals or other sources for cooperative road work in the State." Another act was passed at the same time directing the State Highway Commission to use the funds collected from motor licenses to maintain the roads and bridges of the State, specifying, however, that at least seventy per cent of the funds collected from any county should be used in the maintenance of the roads of that county.

The next decisive step came in 1919 when an entirely new law was passed creating a new State Highway Commission, the chairman of which was to be known as the State Highway Commissioner. This law places considerably more power in the hands of the State Highway Commission as regards road construction than did either of the former laws; but falls far short in the provisions for maintenance. It gave the commission power to lay out a State system of highways "connecting by the most practical routes the various county seats and other principal towns of every county in the State," but it does not authorize the Commission to take over this system and build and maintain it. The present law provides that the selected system shall be constructed in accordance with the rules and regulations of the Federal Aid law; but makes no direct appropriation for this purpose other than that those funds derived from motor license fees shall be available for the upkeep of the Commission and for the construction and maintenance of the State system. In the event that the motor license fees are not sufficient to meet the maximum available Federal Aid the law provides that the council of State may issue bonds, a privilege which the council has

not seen fit to exercise, and as a result the greater portion of the State's quota necessary to meet the available Federal Aid has had to be furnished by the counties.

Wealthy Counties Benefit Most

The present law makes it mandatory upon the State Highway Commission to give preference in construction to any county or counties which may agree to "put up" one-fourth of the cost of constructing the portion of the State highway system which be in or run through such county or counties. A second fourth, in such cases, must be taken from the State's construction fund and the other half from the first Federal Aid funds available. Thus it will be seen that a great deal of initiative in road construction is still in the hands of the counties, and, under such an arrangement, the chances are that the wealthier counties will have all their respective portions of the State highway system constructed previous to and at the expense of the poorer counties. This will mean that we will soon have a lot of county systems of hard surfaced roads stopping at the borders of the richer counties—another case of roads that begin nowhere and end nowhere.

A New Scheme Proposed

It is expected that at the coming session of the legislature a very advanced step in road legislation will be taken. The North Carolina Good Roads Association is advocating that the State highway system which has been partially selected should be extended, taken over, built and maintained exclusively by the State. This would leave the counties free to expend their funds and energies in obtaining county systems connecting up with the State trunk system. The Good Roads Association believes that the State system should be built irrespective of county lines and that no particular section should be favored in mileage or priority of construction. To do this, each of the four districts in which the divisional highway offices are now located should be the center of a construction area, and as far as practicable, the same amount of road should be built in each division each year. Thus, each section of the State would be securing its part of the State highways at the same time as any other section, and the system in the various sections would thus be completed practically at the same time.

In order that the State system may be expeditiously built, it is advocated that a large construction fund be provided. This fund should be derived from a small ad valorem tax of from 5 to 10 cents; and the issuance of bonds in such amounts and at such times as can be economically and expeditiously expended. Thus, the fund may vary from year to year, depending upon the amount of material, machinery, skilled and unskilled labor the Highway

Commission is able to get together to do the construction work.

Patrol System Favored

The Good Roads Association further advocates that a complete system of patrol maintenance be worked out and put into effect at once, so that every mile of State highway, improved or unimproved, will be kept in good condition 365 days in the year. It is thought that such a patrol system can be worked out whereby the patrolmen will be given police powers making it their duty not only to look out for needed repairs on the roads but also to enforce such speed and other regulations as may be made for the protection of the roads and the traveling public. For a maintenance fund, the Association advocates the use of the motor license fees plus, if necessary, a small tax on gasoline. It is believed that the cost of maintaining the roads should be borne largely by the motorist and the automobilist; but the cost of construction should not be borne by him alone as under the present law.

The efforts of the Good Roads Association will be redoubled from now until the meeting of the legislature in the hope that such an overwhelming sentiment for a State system of highways will be created that the legislature will feel constrained to enact the necessary legislation. If such legislation is enacted, North Carolina will, in the course of the next ten to fifteen years, have one of the best transportation systems of any State in the Union; and, with such a system as the Association's program calls for, North Carolina will take her place in the very forefront of States. We believe that the necessary legislative steps to make such a system possible will be taken in January.

McGIRT PREDICTS STATE ACTION

With Advent of New Administration Will Come Forward Movement for Hard-Surfaced Highways

There is no doubt that adequate legislation for the construction of a state system of hard-surfaced highways will be passed by the next General Assembly, sanctioned by the new Governor," was the opinion expressed by W. A. McGirt, President of the North Carolina Good Roads Association when asked for a statement.

"To make sure this achievement," said Mr. McGirt, "we will go into every county in the state and organize the good roads forces so that the people may thoroughly understand the program and hold the lawmakers to strict account."

Mr. McGirt issued the following statement:

"For years past every office seeker has pledged his support to good roads and other legislation favorable to the farmer, and it is a well known fact that the office seeker in many instances has changed his attitude after he became an office holder. This condition may be attributed to a lack of vision or the courage to put through an elaborate program, commensurate with the State's needs, but the fact remains that pre-election pledges are too often broken.

"With a new legislature and a new governor prospects for some real constructive, state-wide legislation in North Carolina are bright and the future outlook more encouraging. With the passing of our present governor will go the so-called sand clay or mud roads as a part of the state system. Great trunk line highways will be built of such material as will withstand the most excessive traffic as well



A Good Road in Floyd County, Georgia

as the heat of summer and the sleet and rains of the winter months. Sections of this state (and there are scores of counties) now isolated and cut-off within this State, will be connected by these highways and centers of trade in North Carolina will no longer be deprived of patronage which rightfully belongs to them, but will enjoy and profit by the business that is now going to Richmond, Danville, Lynchburg, Norfolk and to Columbia, Greenville, Spartanburg, Charleston and points in Tennessee. State highways will give North Carolina merchants the North Carolina business that rightly belongs to them.

"With these highways, the present excessive crop wastage will cease, because the thousands of farmers now isolated will be placed in close touch with competitive markets and the natural result will be stimulation in trade and a steady and unceasing flow of country produce from farmers to the consumers.

"Consolidation of rural schools will come just as fast as the highways are built and this will mean

our own people and to make any substantial gains, North Carolina, as a state, must make the "Home more attractive" for home folks and more inviting to home-seekers. To my mind, there is only one practical solution—an adequate system of State highways. Other improvements will naturally follow after the improved highways are completed.

"The next Legislature will approach the subject in a sympathetic manner," said Mr. McGirt, but the folks back home will not fail to make their wants known at the proper time in an overwhelming demand for relief from a condition that is not only abominable and unbearable, but extremely expensive."

Big Cement Field in Georgia

What promises to develop as the most extensive cement fields in the United States have been discovered in Bleckley county, on the main line of the Southern railroad, nine miles from Cochran. According to the statement of engineering chemists 300 acres out of a total of 1,150 have proven to contain 150,000,000 barrels of raw materials suitable for Portland cement.

This discovery was made early in 1920, and since that time geologists and chemists have been making exhaustive analysis and their report has just been made public. Professor R. C. Holtzclaw, of Morris Flinn Company, of Macon, who has been in charge of research work.

This property is owned by Dr. J. J. Bennett, well-known Baptist minister. Dr. Bennett will incorporate and the company will be known as the Magnolia Development Company. The Southern railroad runs through the property for about one mile and a quarter and two sidetracks have already been laid.

At pre-war prices of \$4.50 per barrel, the cement product already in sight and proven up is estimated to run up into values of millions of dollars.

Officials of the development company are at present: Dr. J. J. Bennett, president and treasurer; Fred N. Merry, vice president and general manager. Temporary offices of the company are at 332 Healey building.

Missouri to Spend 60 Millions

Headquarters for the purpose of furnishing information heeded by the legislature in the enactment of road legislation will be established in Jefferson City by the Missouri Good Roads Federation, of which Major Harry G. Hawes, congressman-elect from St. Louis, is president. M. V. Carroll, of Sedalia, is secretary.

The headquarters here will be in charge of Raymond A. Walsh, who is secretary of the eight standing committees of the organization.

Mr. Walsh says the association will have no legislative program other than to be of assistance to the members of the legislature in framing legislation for the purpose of distributing the \$60,000,000 state-wide road bond issue which was successful because of the activities of the association.

Plans adopted by the various states which have voted state bond issues will be presented to the legislature for their guidance in the drafting of a measure to meet the requirements of the entire state, Mr. Walsh said.



Traveling Through Sand in an Automobile is Difficult

increased efficiency in public schools and a reduction in illiteracy. These improvements call for capital, but the men and women of North Carolina know their needs and realize that improved roads and improved schools will pay dividends big enough to justify the expenditure.

"This state shows by the last census an increase of 15 per cent in population, while the state of California shows an increase of 44 per cent.

"Good roads, co-operative marketing and organization are the three essentials that make the state of California inviting to thousands of farmers who are moving there from other states. It is unreasonable to expect the farmers of this state to cooperate in marketing or to organize for any purpose or even get together for social festivities.

"In certain sections of these state, there are farmers living five or six miles apart that seldom, if ever, get a glimpse of each other.

"If merchants, bankers and manufacturers desire an influx into this state, they must first make some provision for farmers to travel without paying an annual mud tax. Prospective home-seekers seldom question the tax rate, but always inquire about the roads. The most desirable American born settler of these days, whom we would choose to come and share in the development of our resources, is one who will immediately inquire as to the conditions which will affect his welfare in the state in which he is invited to make his future home. To hold



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TIME TO SHOVE AHEAD

The time has come when road building throughout the nation should take on new life and shove ahead. For the past two years materials and labor have been so costly that all except the most pressing projects have been discouraged in many quarters. In fact, so costly was the process many counties and many state highway departments encouraged most new building projects. The taxpayer could not stand the strain of such high costs, coupled with the war bill that the nation must pay.

Now, however, materials have already taken a considerable drop. The labor supply is becoming adequate for road construction purposes. Speculative finance has about run its reckless course and there is going to be money available for financing constructive purposes. During the war and during the two years following the armistice road building has been at a rather low ebb compared with the needs for construction.

With the coming spring there should be inaugurated such an area of road building as no nation ever knew. We are a nation of seven and a half million motor vehicles, and there must be roads to carry them and their burdens. Road building can solve the problems of transportation that have been giving the people of the United States so much concern.

Indications are that many legislatures this winter will provide for great state road building programs, while there is good hope also that Federal interest in roads will be larger than ever before. From out of the present industrial depression we shall emerge into a period of prosperity and progress. Road building can and should lead the way.

To Draft New Highway Bill

Judge James S. Manning, attorney general of North Carolina, and a former justice of the North

Carolina Supreme Court, has agreed to assist the legislative committee of the Citizens' Highway Association of North Carolina in drafting the bill to be presented to the general assembly in January, providing means for constructing a state-wide system of hard-surface highways in North Carolina. Col. T. L. Kirkpatrick, chairman, has announced.

The importance of this bill, which is intended to provide sufficient funds for inter-connecting every county seat and principal down in the state with a hard-surfaced system of roads, is considered of such importance that Chairman Kirkpatrick decided to ask Judge Manning, a man familiar with the law and the requirements, to assist the committee in preparing the bill.

The legislative committee of the association includes Heriot Clarkson, Charlotte, chairman; Judge Jeter C. Pritchard, Asheville; R. A. Doughton, Sparta; T. W. Bowie, Jefferson; D. G. Brummitt, Oxford; A. D. Ward, New Bern; Col. John D. Langston, Goldsboro; O. Max Gardner, Shelby; Walter L. Cohoon, Elizabeth City; M. D. Mills, Wilson; Major J. W. Little, Wilmington.

Construction Industries Plan Exhibit

Representatives of fifteen industries identified with highway construction held a meeting at the Automobile Club of America October 22. The purpose of the meeting was to complete the organization of an advisory committee of manufacturers to cooperate with the American Road Builders' Association in holding a great exposition of highway equipment and materials in connection with the Association's annual convention, which will be held at the Coliseum, Chicago, during the week of February 7th next.

The industries represented at the forthcoming exposition will include the sand and gravel industry; crushed stone; Portland cement; asphalt and oil; tar; granite block; paving brick; slag; road building machinery; quarrying machinery; excavating machinery; trucks, tractors and trailers; concrete mixers; engineering instruments and explosives. It was developed at the meeting that upwards of one billion dollars is annually available for highway and street work and that a genuine necessity exists for capacity production and distribution of highway materials and equipment.

An executive committee to represent the producers and manufacturers was appointed, consisting of J. E. Pennybacker, of the Asphalt Association; B. H. Wit, of the Portland Cement Association; W. T. Chollar, of the Lakewood Engineering Company; D. C. Fenner, of the International Motor Truck Company and P. P. Sharples, of the Barrett Company. A Chicago committee was also appointed, with S. F. Beatty, of the Austin-Western Road Machinery Company, as chairman.

South Plans Great Memorial Highways

Plans for the promotion of a great national highway to be known as the Lee Highway, in memory of Robert E. Lee, have been drawn up by the Lee Highway Association, of which Dr. S. M. Johnson, of Roanoke, Va., is the general director.

The original plans of the organization contemplated a highway along the Appalachian valley between the Blue Ridge, Allegheny and Cumberland mountain ranges, beginning at the Gettysburg Na-

tional Park on the Lincoln highway and running via Winchester, Staunton, by the tomb of Robert E. Lee at Lexington, Natural Bridge, Roanoke, Bristol, Knoxville, Chickamauga National Park at Chattanooga and thence to Birmingham and New Orleans. If the plans of the director are carried out, however, the scope of the undertaking will be broadened and the road will extend from New York to New Orleans, and thence to San Francisco. It would thus be a southern counterpart of the Lincoln highway.

It is believed the proposal to erect a worthy memorial to General Lee in the form of a highway would make an irresistible appeal to the people of the sections through which it passes. The road will also serve as a route of tourist travel from the Appalachians and also a direct route to Florida, New Orleans and the far Southwest. It is urged by the association that the road will have a great economic value on account of the practicability and economy of short-haul motor transportation between the towns on the route.

The movement to construct the Jefferson Davis Highway was launched at the reunion of Confederate Veterans, held recently in Houston, Texas, at which 7,500 persons were present.

The movement was started at a meeting of the Sons of Veterans to have the organization project a transcontinental road through the southern part of the United States and be known as the Jefferson Davis highway.

Concreting Begins on World's Largest Road Job

Actual concreting on the first stretch of Twohy Bros. 280 miles concrete road in Maricopa county, Arizona, was begun November 12. Two mixers operating from what is known as the Fowler setup, will lay the first 41 miles of 16-foot road at the rate of 1,300 feet a day before the material trestle and cement shed are moved. One mixer is seven miles from the material plant, the other two miles.

A second plant is being installed at Chandler, identical with the one at Fowler. The Chandler plant will begin operations about January 1. With the two plants Twohy Bros. expect to build 280 miles of 16-foot road in three years from eight setups.

Materials are delivered in bottom dump railroad cars. The cars are shunted on top of a material trestle from which the tip-over batch boxes are loaded by gravity.

Sand and gravel are obtained from Tempa, where Twohy Bros. have installed a washing and screening plant having a capacity of 1,500 yards per day. Cement is received in bulk and unloaded by means of a Dracco vacuum plant arranged and furnished for this job by the Lakewood Engineering Company. From the time it is loaded into railroad cars, the material does not touch the ground until placed on the road as concrete. The most modern methods are used in every operation. The equipment, representing an investment of nearly a half million dollars includes four 14-E Lakewood gasoline pavers with batch transfers, 18 miles of narrow gauge road track, 12 six-ton gasoline locomotives, 216 Lakewood road cars complete with batch boxes and cement compartments, eight double truck cars, four finishing machines, and sub-graders, two bulk cement handling plants each having a capacity of 900 bar-

rels per day, eight scarifiers and one clamshell bucket.

A Road of Scenic Wonders

Motorists seeking the unusual in travel will find it next summer wearing overcoats and furs on the night of the hottest day in July, crossing the Continental Divide while making the 5,590-mile circle swing of the National Park-to-Park highway, the longest scenic motor way in the world.

The wonder highway is like a scenic running noose, and by following the lariat the motorist reaches the historic ruins of cliff dwellers in Mesa Verde park or the "Top of the World" in Rocky Mountain park, in Colorado. Starting from Denver the highway touches Rocky Mountain park before entering Wyoming, where it passes through Yellowstone. In Montana its course reaches to the extreme northern boundary, touching Glacier Park, then crosses through Idaho to reach Mount Rainier Park, in Washington. The highway continues through Oregon and California and completes the rough circle lariat by winding through Arizona, Northern Arizona and Colorado, getting back to Denver, the starting point.

In the course of the circle which the highway describes the motorist visits the frozen ice fields in Glacier Park, Montana; snow-capped Mount Rainier in Washington; an extinct volcano in Crater Park, Oregon, and an active volcano in Lassen Park, California. Giant redwood forests in Yosemite and Sequoia Parks, in California, and the Grand Canyon in Arizona, also are included in this park-connecting highway.

The National Park-to-Park Highway Association was formed to secure the improvement of the dozen transcontinental highways and connecting roads forming the Park-to-Park highway, including the Yellowstone-Gacier Bee Line, Roosevelt, National Parks, Old Trails, Rainbow and Yellowstone trails. Rainbow and Yellowstone trails. The association hopes eventually to secure Federal aid in the sum of \$100,000,000 for hard-surfacing this continuous highway. The only stretch of hard-surfaced road at present is 1,000 miles of the Pacific highway, extending from Seattle to San Francisco.

Miss H. M. Berry, secretary North Carolina Good Roads Association, has just returned from Elizabeth City, where she attended a luncheon of the Chamber of Commerce and a general meeting, both held in the interest of State highways. These meetings were attended by members of the legislature and many others from Pasquotank and nearby counties. She reports a vigorous enthusiasm for State highways from this general section, as the counties in this Northeastern area should be included among North Carolina's "lost provinces" as truly as the Northwestern counties, the Southwestern counties and the Southeastern counties. These counties of the northeast represent a vast area of one of the State's most fertile regions—one that the State can ill spare in her economic, agricultural, social and political development.

Austin, Tex.—The attorney general's department approved a \$200,000 issue of Fayette county road bonds of District No. 8, maturing serially and bearing six per cent interest.

Fourth International Road Congress

By ARTHUR BLANCHARD

Professor of Highway Engineering, University of Michigan

THE First International Road Congress was held in Paris in 1908. At this Congress, the Permanent International Association of Road Congresses was formed with headquarters in Paris. The Second Congress was held in Brussels in 1910.

The Third International Road Congress was held in London in 1913, at which time there were 3,793 members of the Association. The business sessions of the Congress occupied about one week and were devoted to a thorough discussion of the subject matter of 123 reports pertaining to the 19 topics on the program of the Congress. During the final business session, progressive conclusions relative to each topic were adopted by the Congress. The government of the United States was the only world power which was not a member of the Association when the Third Congress was held. The records of the Third Congress indicate that the following important countries were members of the Association: Austria, Belgium, France, Germany, Great Britain, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden and Switzerland. Of the smaller countries, it is interesting to note that our neighbors, Cuba and Mexico, sent government delegates to the London Congress and are government members of the Association.

The International Commission of the Permanent International Association of Road Congresses, at its meeting held in Paris on June 21, 1920, unanimously voted to accept an invitation to hold the Fourth International Road Congress in the United States in 1922 provided an invitation from the United States government is received by the executive committee of the association before January 1, 1921. If an invitation is not received from the United States on or before December 31, 1920, the invitation from the Italian government will be accepted. As a regulation of the association stipulates that an International Congress cannot be held in a country whose government is not a permanent member of the association, it will be necessary for the United States Congress, during December, 1920, to pass an appropriation which will provide for the annual subsidy of the United States as a government member of the association and which will enable the secretary of state to extend an official invitation to the association to hold the Fourth International Road Congress in the United States in 1922.

The object of the association is to promote progress in the improvement of highways and the efficiency of highway transport throughout the world. The work of the association consists in organizing International Road Congresses, publishing reports, papers, proceedings and other documents and collecting information relative to highway improvement and highway transportation.

The membership of the association consists of representatives of governments, delegates of corporations and individual or private members. The business affairs of the association are managed by the permanent international commission, which is composed of members representing the various gov-

ernments having membership in the association. Each government has the right to one representative for each 1,000 francs of its total annual subsidy, provided, however, that the number of representatives from any one government does not exceed fifteen.

Individual or private members pay annual dues of 10 francs, or compound for a life subscription by the payment of one sum of 125 francs. Due to the current rate of foreign exchange, it is practicable for Americans to become life members by the payment of the subscription of 125 francs through the medium of a bank draft, which will cost, at the present time, between \$9.50 and \$10.00. Life membership dues should not be sent by an international postal money order, as an order for 125 francs will cost approximately \$25,000. Bank drafts should be made payable to the Permanent International Association of Road Congresses and be sent to Professor Paul LeGavrian, general secretary, Permanent International Association of Good Road Congresses, 1 Avenue d'Iena, Paris France.

Individual members receive, free of charge, all of the publications of the association, including papers, reports, and proceedings of congresses, which, in times of peace, are held triennially. The reports and proceedings of the Third International Road Congress, measure, when stacked, about 6 1-2 inches by 9 1-2 inches by eight inches in height. The reports contain reliable information pertaining to the progress in highway development and highway transportation in all important countries and hence serve as an encyclopedia of foreign practice. Members also receive the bulletin of the association, each issue consisting of forty to fifty pages devoted to official notices, minutes of meetings of the International Commission and the executive committee, and reviews relative to highway improvement and highway transport in different countries. All the literature, sent to American members, is printed in English.

The International Association should be supported by Americans, who wish to see the science and art of highway improvement and highway transport rapidly develop throughout the world, who believe in an international medium for the exchange of opinions and conclusions, and who wish to be well informed relative to progress in highway engineering and transportation in foreign countries. Americans should not be satisfied with joining the Association as individual members. Although every courtesy was extended to the United States members of the association at Paris, Brussels and London, nevertheless every American who has attended an International Road Congress has wished to apologize because his government was not a permanent member of the association. Considering the phenomenal development of highway improvement and highway transport in the United States, and the active part which the United States government is taking in highway construction through the medium of the Federal Aid act, it requires no elaborate arguments to demonstrate the advisability of the

United States government becoming a permanent member of the association. The status of the United States as a leading world power demands that its annual subsidy should be the maximum allowed by the constitution of the association, that is, 15,000 francs, which will provide for fifteen representatives of the United States on the Permanent International Commission. It is the duty of every American, who wishes to support the work of the International Association and to have an International Road Congress held in the United States in 1922 to write to his representatives in Congress urging them to vote favorably on an appropriation to provide for the annual subsidy of the United States as a government member of the Permanent International Association of Road Congresses.

Progress in North Carolina

Eight hundred and three miles of roads, 183 of which are permanent hard surfaced construction had been built, were under construction or under contract at a total of \$11,143,128.52 on November 1, according to figures given by Frank Page, chairman of the North Carolina Highway commission.

A year from now Commissioner Page hopes to have twice that much road work under way, and two years from now he hopes that it will be trebled. Eventually, which means as soon as it can be done

economically, he hopes to see ever the most vivid dreams of road enthusiasts come true and the whole State netted roads of the most modern type.

Merchants Will Finance Highway Survey

Immediate raising of funds to finance a re-survey of the Virginia-Carolina highway which runs parallel with the Dismal Swamp canal was decided upon by the Retail Merchants' Association of Portsmouth.

The government has required that the highway be 100 feet from the banks of the canal and drained on both sides, which will necessitate a new survey on the project.

William M. Irwin, who has been acting as deputy county engineer of Jefferson County, Kansas, for the past year and a half, has been appointed by the commissioners of this county to fill the vacancy of county engineer which was caused by the resignation of E. E. Clark.

E. J. Terrill has been appointed resident engineer on Federal Aid road project No. 37, with headquarters at Independence, Kansas. He was formerly assistant engineer on Federal Aid project No. 4, in Shawnee County, Kansas.



A Tennessee Good Road

Managing a County's Business

By T. G. FARMER

Clerk and Attorney for Coweta County (Ga.) Road Commissioners

THE problem of managing a county's business is one of the biggest facing any Board of Commissioners of Roads and Revenue, and I know it is one that gives all conscientious commissioners serious thought and worry. For some reason the general public, and sometimes commissioners themselves, do not look upon the business of a county with as much appreciation of its importance as they should. Many seem to think that county affairs are less important than are those of private corporations of the same size and magnitude. But the management of a county's business should be placed upon the same level, if not higher, than that of private institutions.

To properly manage the business of a county, there must be earnest cooperation among the several members of the board, and the clerk and other employees. There must be system and there must be some one upon whom responsibility can be placed. I know, both from experience and hearsay, that county commissioners are usually paid small salaries, that all of them have their private business affairs to look after, and consequently do not have the time to devote to county affairs that they should. Therefore, it is very important that a clerk be employed who is thoroughly competent, well informed, and who is broad enough to shoulder responsibilities placed upon him.

Experience has taught me that one of the most important things for a county to have is a modern set of books, which, when properly kept, will show at any time, to any citizen of the country or to any member of the board, the exact status of the county affairs. These books should show all amounts received, and from what source; the amount of disbursements, and for what purpose; what amount expended for new bridges, as well as for repairs on bridges, courthouse, jail, etc.; the amount expended in each district of the county for free labor, etc.; the amount expended by the convict camp in the several districts, and on what road; the amount expended for officers of the county, and fees paid by the county to the different officers; amount spent for books and stationery; expense of courts, for lunacy proceedings in the Ordinary's Court, Superior Court and City Court, and any other expense properly chargeable to the county. These books should be audited each year by a competent auditor.

Making Purchases

Purchases of supplies of one kind and another for county purposes is one of the most important features of a county's business. If every commissioner, the clerk, the superintendents, and heads of different departments are allowed to purchase material, etc., it is difficult to keep accurate account of the numerous transactions, and is altogether unbusinesslike. In order to place the responsibility each purchase should be made through the office of the Board of Commissioners, and a written order given for such purchase. By pursuing this method the clerk will know at the end of the month exactly

what the orders were given for, and these orders should be attached to the bill when presented for payment. The head of each department should make requisition on the clerk of the board for supplies needed, then let the clerk make the purchase by written order, keeping a duplicate of same. By this plan the clerk will be in a position to know, when the bill is presented, whether it is correct or not.



A Bridge across the New River at the Narrows,
in Giles County, Va.

If anyone else is allowed to make purchases, when they are made he should get an order from the clerk giving the amount and price of the purchase.

In this state (and I suppose in all states), counties are allowed to levy taxes for certain specific purposes, and only a certain amount for those purposes; therefore, when these taxes are levied and collected they are supposed to be spent for the special purposes for which they were levied. It is important that commissioners anticipate the county's needs for each purpose, and levy accordingly. If

the bookkeeping system mentioned above is employed there should be no trouble in keeping the various funds thus raised properly segregated. In collecting taxes it is important that the commissioners keep in close touch with the tax collector's office, and in no event should the tax collector be allowed to credit for anything off the digest on account of errors, reliefs, etc., until an order is given by the Board.

Collecting Taxes

Road tax collections are often handled in a very unbusinesslike manner. My system is that at the first of each year, between January 1 and April 1, to require each road supervisor to take a census of his district, showing the number of males in his jurisdiction subject to road tax for that year. He is then charged with each one at the rate of tax per head fixed for the year; and he must account for each one reported, unless relieved by the board for good and sufficient cause. Supervisors are under bond, and required at the first of each month to make a report to the board, showing the amount collected, and giving in detail names of persons, the serial number of the receipt given each person, etc. Each supervisor is given a specified number of receipt books. The receipts are numbered. He is charged with each receipt book and held accountable for each receipt contained therein.

I find it to be a great time-saver, resulting in much less confusion, to have a regular order of business on each meeting day of the board. For example, our order of business is as follows: 1—reading minutes of previous meetings; 2—reading and approving bills for payment; 3—receiving bids for supplies, etc.; 4—approving bonds, if any; 5—reading and receiving reports of officials; 6—receiving visitors; 7—miscellaneous.

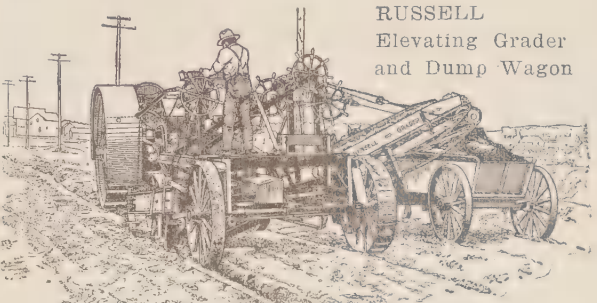
It is impossible to go into length detail regarding all matters incident to the proper management of county affairs in the space allotted to this article. There are several that I will merely mention, such as operating county farm, convict camp, free labor camps, settlements with tax collector, method of purchasing, etc.

In conclusion, let me say that officials in charge of county matters should at all times follow the law to the letter, and manage affairs with the same scrupulous care that they would give to their private businesses.

One-fourth of the counties of North Carolina, one-sixth of her area, one-eighth of her population have had to seek their trade and social connections in other States. Why? Bad roads! Ten other inland counties, not being able to get into other States, are dying from poor circulation which may result in pernicious anemia. Why? Bad roads. The additional agricultural output of these counties, encouraged by adequate roads, would pay for the roads in five years.

Last year North Carolina consumed approximately 50,000,000 gallons of gasoline. This is from one-third to one-half more than was necessary to carry the same tonnage the same distance over good roads. The difference represents just a little of our tax to the bad roads—a little matter of five to six million dollars annually. The farmer is hit first by this tax, next the country merchant and finally all of us pay the bill.

Ben Allen, who for the past few years has been district engineer for Wallace and Logan counties, Kansas, has resigned and accepted the position of county engineer for Finney County, Kansas. Finney County is building thirty miles of Federal Aid road, and Mr. Allen, with his construction experience, will be invaluable to that county on this work.



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Good Roads Notes In Brief

Jackson, Miss.—Before the adjournment of its regular monthly session the Hinds county board of supervisors offered for sale a \$200,000 block of the million dollar bond issue recently authorized for road improvement work.

Charleston, S. C.—Definite steps toward the issue of \$500,000 worth of bonds by the Sante Bridge district, comprising the counties of Charleston, Berkeley and Williamsburg were taken at a meeting of the Santes Bridge commissioners at the chamber of commerce.

Columbia, Tenn.—The county has authorized the issuance of \$300,000 highway bonds.

Pulaski, Tenn.—\$350,000 bonds have been issued for the construction of new roads in Giles county.

Jamestown, Tenn.—Fentress county voted \$200,000 road bonds.

Wilmore, Ky.—Paris item: \$75,000 worth of road bonds is for sale in Bourbon county.

Decatur, Ala.—The Chamber of Commerce petitioned the court to call an election on the issuance of good roads bonds totalling \$450,000.

Austin, Tex.—The Valverde county has voted on a large bond issue for the erection of bridges across the Pecos and Devil's rivers to main highway No. 12, the shortest route from the southeast to El Paso.

Austin, Tex.—It is proposed that Travis county make a general county bond issue of \$150,000.

Shelbyville, Tenn.—The contract has been let for the reconstruction of the great Dixie highway from the Davidson county line to Murfreesboro to B. W. Williams, of McMinnville, at \$29,000 per mile.

Princeton, Ill.—Contract for federal aid grading and bridge work on seven of the principal highways in the state amounting to about three quarters of a million dollars, were let by the highway department.

Central City, Ky.—The state road commissioners opened bids at Frankfort for the construction of the Central City and Greenville state highway, but on account of a hitch in the Federal road department's approval of the project no award of the contract has yet been announced.

Nashville, Tenn.—The Weakely county, Reelfoot lake wing of the Memphis-to-Bristol highway, leaving the latter at Huntington and extending through McKenzie, Gleason, Dresden, Martin and to Reelfoot Lake via Union City, Troy and Hornbeak, Obion county, is already under construction.

Charleston, W. Va.—The state road commission states that the good road bond issue amendment carried.

Columbia, Tenn.—Permanent surfacing is being put on the section of the new Jackson military highway between Ashton's mill and the Bear Creek turn pike.

Knoxville, Tenn.—A Federal, state and county highway from Knoxville to the North Carolina line, by way of Sevierville, Gatlingsburg, Fighting Creek and Elkmont is being advocated in Sevier county.

E. C. Wenger is now resident engineer on Federal Aid road project No. 22, in Finney county, with headquarters at Garden City, Kansas.

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South Carolina Road Activity

Maintenance agreements are fast being signed by the state highway department with counties of South Carolina, and announcement is made of several new maintenance agreements with counties.

An agreement with Spartanburg county calls for the maintenance of thirty-six miles of roads and \$17,159 is to be turned over to the county at once for this work. The roads to be maintained are the Duncan road for fifteen miles, the Cowpens road, seven miles; the Cedar Springs road, two miles; the Shensee road, 15 miles; to the North Carolina line for seven miles. About \$5,000 of the money is to be used for equipment and signs.

Agreement with Bamberg county calls for the maintenance of 18 miles of the Bamberg-Allendale road, \$7,000 being turned over to the county.

An agreement with Allendale county calls for construction, not maintenance, of eight miles of the Barnwell road with \$2,944.

Agreement with Pickens county calls for maintenance of the Greenville-Central road 17.3 miles; Pickens-Liberty road, 6.3 miles, and the Easley road, 5.8, with \$6,745.

Union county has entered agreement with the highway commission, whereby the state will reconstruct two miles of the Union-Laurens road and three miles of the Lockhardt road, \$13,000 going to the county from the state highway funds.

Agreement with Chesterfield calls for the maintenance of 2.14 of the Cheraw-Society Hill road and construction of the Cheraw-Chesterfield road, the county getting \$8,370.

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“Did such excellent work that we decided to purchase another.”

“The very best investment we ever made.”

“Worth its weight in gold.”

“Earned its cost several times over in four months.”

Buffalo Springfield Pressure Cylinder Scarifiers can be ordered with new Buffalo Pitts or Kelly Springfield Rollers or they can be attached in the field to old rollers already in service.

INQUIRIES INVITED

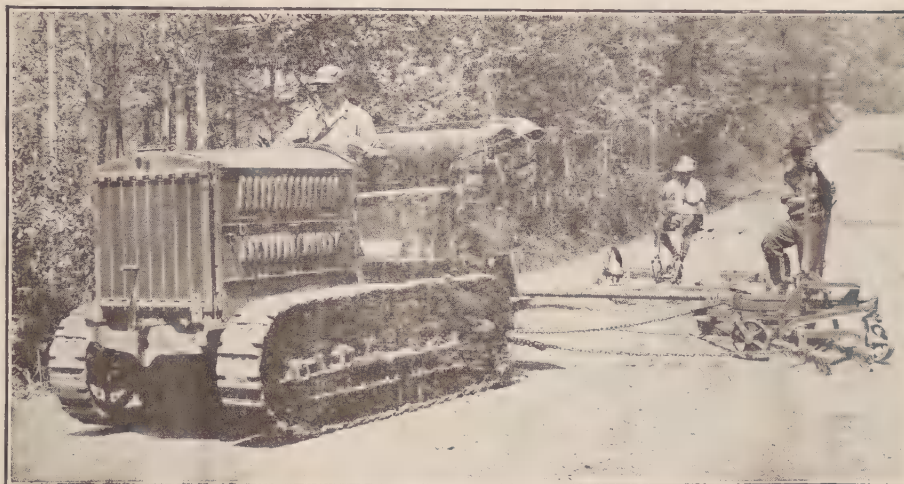
The Buffalo Springfield Roller Company

SPRINGFIELD, O.

"CATERPILLAR"

TRACTORS REG. U.S. PAT. OFF. **and**

Road Maintenance



SYSTEMATIC maintenance is the price of good roads. Dragging after rains is necessary to really fill the ruts, cut off the humps and provide the drainage necessary to maintain the proper road surface. Road builders everywhere have found in the "Caterpillar" the one really dependable power for road-building. On road maintenance the 5-Ton "Caterpillar" with a road maintainer or drag will work 15 to 30 miles of road per day. Where cuts and fills are necessary, the "Caterpillar" Tractor with the "Caterpillar" Land Leveler provides the most economical method for moving the dirt—a 6' Leveler with a 5-Ton Tractor or an 8' Leveler with a 10-Ton Tractor, depending upon the size of the job to be handled.

Sumter County, Georgia, is using one of their 5-Ton tractors on road maintenance work. Pulling a road maintainer, the 5-Ton "Caterpillar" is single dragging 30 miles per day or double dragging 15 miles per day. This outfit is replacing 16 mules and 8 drivers with a saving of \$1.32 on every mile of road dragged. Everywhere roads are built and maintained, "Caterpillar" Tractors are found substantially reducing the daily and yearly cost.

"Eight Years and Still Going"

Cissna Park, Ill.

"The satisfactory service received from our 'Caterpillar' Tractor purchased in 1911 may interest you. An accurate account has been kept of the miles graded and the total cost, and the tractor has certainly paid for itself many times over and given us the best roads in our County. I cannot see why we cannot get eight more years' service out of it, but if this tractor ever does wear out, our next one will certainly be a 'Caterpillar.'"

Geo. Keidel, Commissioner,
Pigeon Grove Township"

Our exclusive trade-mark—"Caterpillar"—registered in every country, protects every buyer and insures Holt standardized service

There is but one "Caterpillar"—Holt builds it

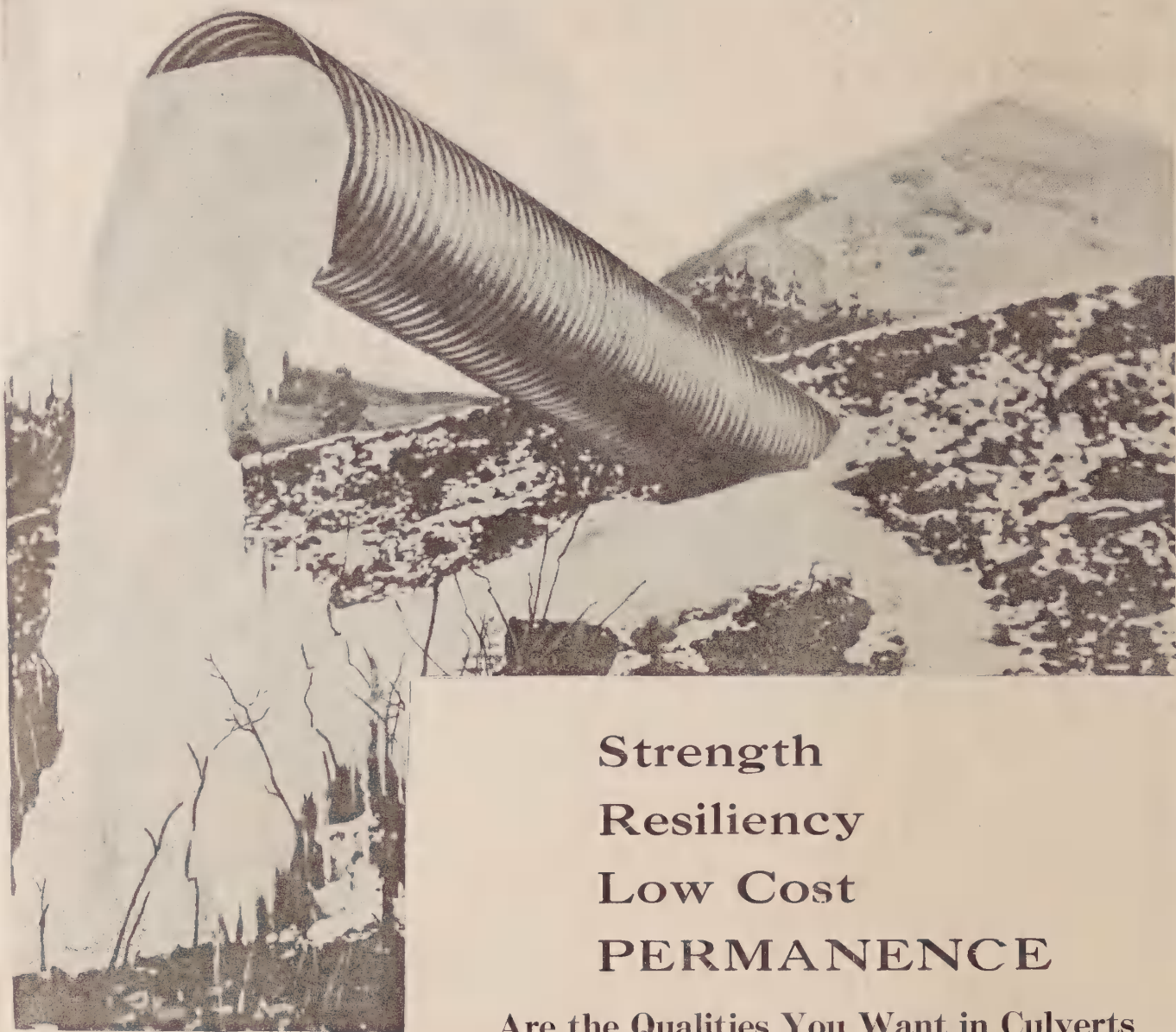
THE Holt Manufacturing Company

Incorporated

PEORIA, ILL. STOCKTON, CAL.

New York, N.Y. Spokane, Wash.

Armco Culverts for Permanent Roads



Strength
Resiliency
Low Cost
PERMANENCE

Are the Qualities You Want in Culverts

Tens of thousands of ARMCO culverts have "Stayed Put" since the day they were installed.

WRITE FOR "EVERYWHERE IN THE U. S. A."



The Dixie Culvert & Metal Co.

Jacksonville, Florida

ATLANTA, GEORGIA

Little Rock, Ark.



Atlas Explosives



"A PROPER explosive for every blasting requirement" is provided in the ATLAS line. But—of equal importance to users of explosives—is the SERVICE behind Atlas Explosives.

Each particular explosive differs from every other explosive in strength, velocity, volume, cold resistance, water resistance or other factors. Therefore the Atlas Service Man diagnoses conditions and prescribes the explosives best suited to meet each individual requirement of the user.

We are confident that if you will but utilize this ATLAS service—

First: Your blasting will be done more efficiently.

Second: Your blasting will be done more economically.

Third: You will be glad you put your blasting problems up to us.

Address our home office or the nearest of our branch offices.

Branch Offices: Allentown, Pa.; Birmingham, Ala.; Boston; Chicago; Des Moines, Ia.; Houghton, Mich.; Joplin, Mo.; Kansas City; Knoxville; McAlester, Okla.; Memphis; Nashville; New Orleans; New York; Philadelphia; Pittsburgh, Pa.; St. Louis; Wilkes-Barre, Pa.





for Every Purpose

MAKES THE CONCRETE TOUGHER—

AGASCO ROAD OIL

Seal-Coat for Concrete Paving

Spread over the surface of the concrete as road is completed, AGASCO Road Oil prevents it from drying too rapidly—Acts as seal of the moisture until concrete has set thoroughly.

AGASCO ROAD BINDER

for smooth, resilient, dustless roads—
Holds the mass together.

AGASCO PAVING PITCH

filler and cushion for granite cube, wood-block or brick pavements—Does not crack, crumble or shrink.

AGASCO Preservative Paints: Number Nineteen (for metal) and Number Fifteen (for wood) protect bridges against the elements.

ATLANTA GASLIGHT CO.

ROOM 232, 14 FAIRLIE STREET, ATLANTA, GA.



An 18" Diameter "GENUINE OPEN HEARTH IRON" Culvert Pipe in use on the Weldon-Jackson Highway in Northampton County, N. C. Photograph taken Feb. 17, 1916.

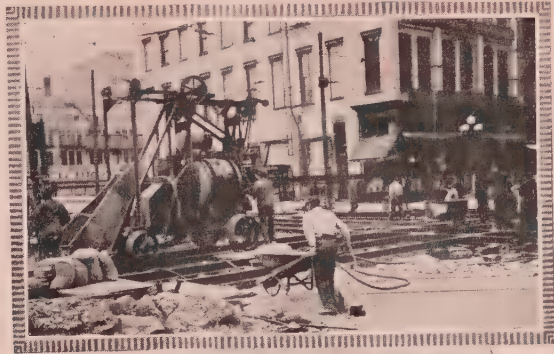
THE photograph above gives an excellent idea of the resistance of "Genuine Open Hearth Iron" Culverts to extraordinary wear. It is not often that a Culvert of any type has to withstand the direct wear and tear of the heavy traffic coming in contact with the bare surface, but such is the case in this instance. This Culvert has been in use since the Fall of 1910, and as the picture was taken February 17, 1916, you can readily understand that it must have had rather hard knocks in that length of time. Our Mr. J. H. Slaghter took this photo with a kodak and states that not only was this Culvert exposed in the manner shown, but at least a dozen more on the same road were installed under like conditions and have been subjected to the same rough treatment for the past few years.

We not only claim superiority for the material of which our Culverts are made, but also superiority of workmanship, and therefore of the lasting qualities of our Pipe. We manufacture only one grade of "Genuine Open Hearth Iron" Pipe and have no seconds to offer in this material. Being a high grade material, it costs us more money than the ordinary grade of Galvanized Steel, and quite naturally we have to secure a better price for it. Therefore, beware of cheap Culvert Pipe.

The Newport Culvert Company Inc., Newport, Ky.

KOEHRING

the Mixer of Extra Liberal Drum Dimensions



THERE'S room in Koehring drums to handle full rated capacities, with the room to spare that is essential to through, non-slop mixing.

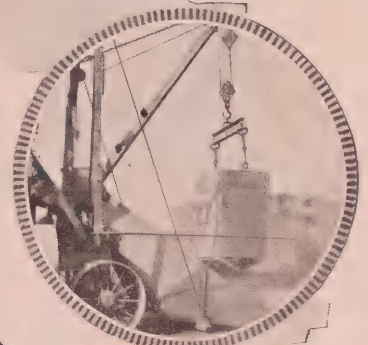
Koehring heavy duty construction is the greatest safety factor you can put on the job.

It stands up to continuous high-speed operation—delivers the utmost season's yardage—a big extra yardage. The Koehring Paver—with the extra automatic actions of the Koehring distributing boom and bucket—is the fastest paving unit. Write for catalog—and do it now to insure on-time delivery of your order.

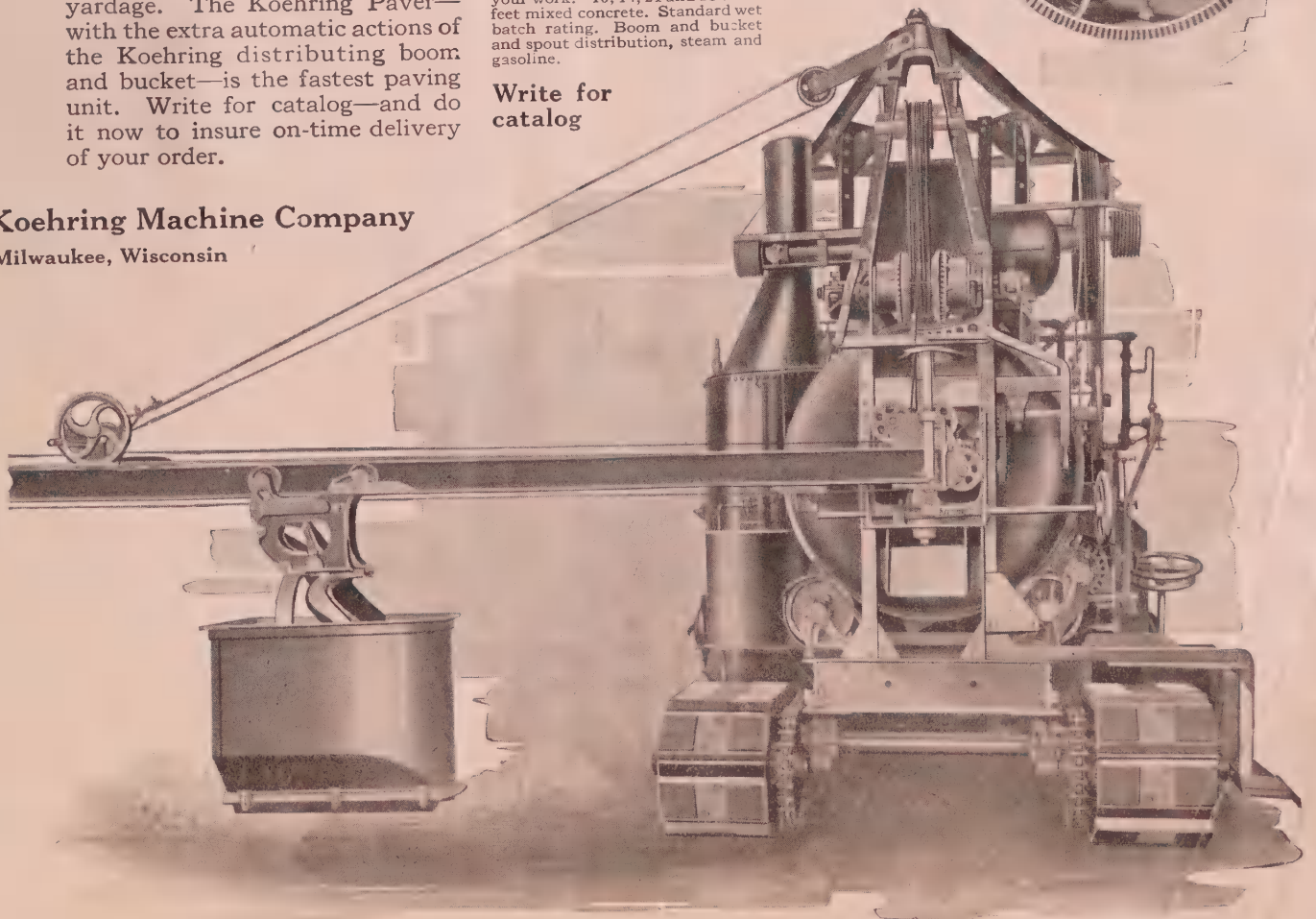
Four Capacities

Four capacities in the Koehring line enable you to fit the mixer to your work. 10, 14, 21 and 28 cubic feet mixed concrete. Standard wet batch rating. Boom and bucket and spout distribution, steam and gasoline.

**Write for
catalog**



Koehring Machine Company
Milwaukee, Wisconsin





An all-Asphalt Road *after ten years of service*

In 1910, Yosemite Street, Madera, California, was paved with 5 inches of asphaltic concrete. Not a cent has been spent on it for maintenance. It is in good condition.

In sharp contrast with this example of all-flexible pavement stand many of California's roads of all-rigid construction. Built some years later, some of these roads are failing, shattered by traffic. In cost per year they are proving expensive investments, while standard types of asphalt roads are making remarkable records for both service and economy.

Public officials, engineers and contractors will find much technical information and data on the construction of all-asphalt, flexible roads in our Asphalt Association Brochure No. 12, "Asphalt Base Pavements". Sent free on request.

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25 West 43rd Street, New York City

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Proved through the Ages



